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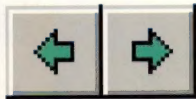
A large, gold-colored circular medal with the words 'TECHNICAL EXCELLENCE' around the top and 'PC MAGAZINE' in the center. It is set against a background collage of various technology-related images: a Toshiba keyboard, a laptop, a Netscape Navigator box, a PointCast box, a man wearing sunglasses, and a satellite dish.

Our 13th Annual Awards

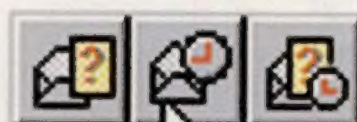
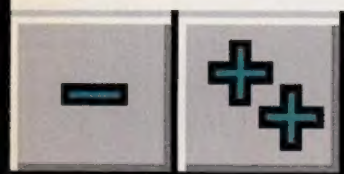
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Team Update

TeamStatus

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To: Kate Tregoning
Subject: TeamStatus
Date: Mon 8/26/96

Kate -
How is this task coming along?

Update as of: Mon 8/26/96 4:00 PM

To:	Task Name	Start	Completed	Remaining
Kate Tregoning	Acquire review docs	Mon 8/26/96	0h	16h

Please review Project pack shot - Microsoft Exchange

File Edit View Insert Format Tools Compose Help

To: Bob Moore
Cc: John Zagula; Don Hall; Jolie Lenehan
Subject: Please review Project pack shot



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Microprocessors March On



Sometimes the little things make a big difference. Certainly that's been true of the microprocessor. When Intel introduced the 4004, 25 years ago this month, it

changed the industry more than anyone involved could have imagined. In fact, it's hard to name another product introduced in that period that has

spawned an industry with such a pervasive impact on the way we work, the way we play, and the way we learn.

Almost immediately after their introduction, microprocessors became the heart of the personal computer. Since then the improvements have come at an amazing pace. (See the time line on page 147 for a look at the history of the microprocessor.) The 4004 ran at 108 kHz—that's kilohertz, not megahertz—and processed only 4 bits of data at a time. Today's microprocessors and the computers that run on them are thousands of times faster. Effectively, they've come pretty close to fulfilling Moore's Law (named after Intel cofounder Gordon Moore), which states that the number of transistors on a chip will double every 18 months or so. Performance has increased at nearly the same rate.

Can the pace continue? Well, nothing can increase forever. But according to Gerry Parker, Intel's executive vice president in charge of manufacturing, we are far from the end of the line in terms of microprocessor performance. In fact, we're constantly seeing new advances in technology, one example being new forms of lithography that let designers position electronic components closer and closer together on their chips. Processors are created now using a 0.35-micron process. But next year we'll see processors created at 0.25 microns, with 0.18 and 0.13 microns to be introduced in the years to come.

It's not just improvements in lithography and density that can boost performance, Parker notes. Designers can create microprocessors with more layers of metal tying together the transistors and other circuit elements. The more layers, the more compact the design. But these ultracompact microprocessors are also harder to manufacture and validate. New chip designs take up less

space, resulting in more chips per wafer. The original Pentium (60/66 MHz) was 294 square millimeters, then it was 164 square millimeters (75/90/100 MHz), and now it's 91 square millimeters (133- to 200-MHz versions).

When will all this end? Interestingly, it may not be the natural limits of technology that will eventually refute Moore's Law. Instead, it's more

likely to be the cost of each successive generation. Every new level of advancement costs more, Parker explains, making microprocessor development a hugely capital-intensive business. Currently, a fabrication plant with the capacity to create about 40,000 wafers a month costs some \$2 billion. And the rapid pace of innovations means equipment can become obsolete in just a few years. Still, there are ways of cutting some costs, such as converting from today's 8-inch silicon wafers to larger, 300-mm (roughly 12-inch) wafers, which can produce 2.3 times as many chips per wafer as those now in use. Moving to 300-mm wafers will cost Intel about \$500 million in initial capital, Parker says. But if you're talking about building a large capacity, the economics per die are very favorable.

Still, nothing lasts forever. As Parker notes, the PC industry is built on the assumption that we can get more and more out of the PC with each generation, keep costs in check, and continue adding more value. We will run out of money before we run out of technology, Parker says. When we can't hold costs down anymore, then it will be a different business.

When does Parker guess processor technology will stop growing at its current pace? In 2017, plus or minus a decade. At that point, we'll reach some physical limits. Until then, there are still technical and economic challenges that have to be met. But then again, coming up with new ways of meeting these challenges is something chip makers have been doing for 25 years.

A stylized, handwritten signature of Michael J. Miller in black ink.

MICHAEL J. MILLER

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That not-very-boxy box pictured above is the new network computer from Sun. Now, we're not going to get into speeds and feeds other than to say it probably performs as well as or better than what's on your desk right now. But that's where all comparisons end. Because this, folks, is the computer of the future.

You see, with JavaStations on your intranet, the bulk of your computing power resides on the network. Which means you can deploy and manage applications from one central location. We're talking unprecedented cost savings per seat, ease of administration, built-in security and global software compatibility. Plus, thanks to the Java™ platform's independence, there's no risk to your current investment in hardware or software. So, the question isn't are they going to catch on (over 60 percent of the Fortune 1000 companies are already using Java technology). It's more like, when are you?



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The 13th Annual Awards For Technical Excellence

BY MICHAEL J. MILLER



We celebrate technical excellence among the products that shipped over the past year. What is technical excellence? More than anything, it's a high order of creative thinking that looks beyond existing technologies to point us in fruitful new directions. Technical

excellence is rare, but its power to change the computer industry is unmistakable. After a month-long debate, the editors and Labs staff of *PC Magazine* selected 10 winners and 19 finalists out of the thousands of products that shipped within the past year. We also honor the people behind these groundbreaking developments.....101

Desktop Systems.....	102
Application Software.....	103
Portable Systems.....	104
Graphics Software.....	108
Networking Hardware.....	118
Online.....	122

Networking Software.....	126
Peripheral Hardware.....	131
Development Tools.....	135
After Hours.....	139
Person of the Year.....	142
Lifetime Achievement.....	142



ONLINE



What's New Online

Home Bound

Use our exclusive interactive viewers to sort all

the benchmark-test and price/performance scores for this issue's evaluation of home PCs, using whichever criteria interest you most. Also on the Web: daily Trends reports analyzing industry news.

UP FRONT

From the Editor-in-Chief.....4

Pipeline.....9

Letters.....21

Trends.....28

► The so-called network

computer

► Chip engineers talk shop

► Write CDs, then rewrite them

► Inside PC Labs

First Looks.....45

► Psst! Keep a secret?

Four cryptography programs

► CompuServe 3.0

► DataBurst ISDN 128K

► Web Buddy 1.0

► Three 21-inch monitors

Second Looks.....81

► Newton's flip-flop

► Instant desktop studio

► The ISDN answer

COLUMNISTS

JAKE KIRCHNER.....32

BILL MACHRONE.....85

JOHN C. DVORAK.....87

INSIDE TRACK.....89

JIM SEYMOUR.....93

BILL HOWARD.....95



PCs

High Style, High Speed

BY BILL HOWARD

PCs for the home have a new attitude. No longer just big boring beige boxes limited to computing, today's models arrive in cases of purple, charcoal gray, and emerald. They come with lots of fresh new hardware built in—phones, television tuners, and remote controls. They're even well priced, at \$2,000 to



\$4,000. We rounded up 18 of this new breed from 10 vendors and put them through their paces. And you won't believe what vendors are doing with monitors: Several of these systems' models feature built-in speakers, extensive volume control, and CD playback options. One even has a flashing light to indicate phone messages.....150

Acer America Corp.....	157	Packard Bell.....	199
Compaq Computer Corp.....	163	Sony Electronics Inc., Information Technology of America.....	203
Gateway 2000 Inc.....	174	Toshiba America Information Systems Inc.....	206
Hewlett-Packard Co.....	177		
IBM Consumer Division.....	188	How to Read the Ratings Boxes.....	152
Micron Electronics Inc.....	192		
NEC Computer Systems Division.....	197		

Editors' Choice.....	153
Picks and Pans: Home PCs.....	156
Price/Performance Index.....	158
Apple's Performa 6400/200.....	166
Performance Tests.....	170
Summary of Features.....	180
PC/TV: If You Can't Beat 'Em, Join 'Em.....	192



HOLIDAY GIFT GUIDE

101 Holiday Gift Ideas

BY MICHAEL E. RYAN

It's the most wonderful time of the year. That's right, it's the holiday season, which means that it is also time for *PC Magazine's* third annual Holiday Gift Guide. We preview [and otherwise check out 101 products](#), including more than [50 games](#), [25 children's software titles](#), and a bunch of nifty gadgets. And all of these products are scheduled to be on store shelves in time for your holiday shopping. There's something [here for all the computer users on your list](#).....349



GAMES AND ENTERTAINMENT.....	350
Action.....	350
Adventure.....	351
Arcade/Classic.....	354
Simulations and Sci-Fi.....	360
Sports.....	360
Strategy.....	363

GADGETS AND GIZMOS.....	365
CHILDREN'S SOFTWARE.....	367
Ages 3 to 8.....	367
Ages 8 and Up.....	369
PRODUCTIVITY AND FUN.....	372
REFERENCE SOFTWARE.....	377

SPECIAL TIME LINE

The Microprocessor at

A chip-by-chip look back at the milestones in the development of the microprocessor, from the first Intel 4004 to the Motorola 68000 to the Intel Pentium Pro with 5.5 million transistors147

PC TECH

Power Debugging.....	209
Two powerful Windows tools.	
Operating Systems.....	223
Multiple OSs on one computer.	
Power Programming.....	233
Building a COM object with ATL.	
Internet Tools.....	241
LDAP: Directory protocol on a diet.	
Utilities.....	249
FDFiles locates unused files.	

PC SOLUTIONS

User-to-User.....	251
Auto-start a Recorder macro.	
Ask Our Advisors.....	260
Hardware: Upgrading processors and motherboards.	
Operating Environments: Changing Windows 95 icons.	
Word Processing: Tracking paragraph changes in Word.	
Spreadsheets: Automating the YTD function.	
Databases: Custom splash screens in Paradox for Windows.	

AFTER WORDS

Abort, Retry, Fail?.....	390
--------------------------	-----

ALSO IN THIS ISSUE

PC Direct.....	251
PC Magazine Marketplace.....	300
Premier.....	300
Classified.....	327
BusinessCard.....	346
Reader Service Card.....	335
Advertisers' Index: Companies.....	385
Advertisers' Index: Products.....	386
Coming Up.....	388
Editorial Product Index.....	389

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Upgrade to OmniPage Pro and get the recognition you deserve.

OmniPage Limited Edition or **OmniPage Lite** is the OCR that came with your scanner. They give you basic OCR.

How to Improve Your OCR Accuracy and

Caere Corporation (NASDAQ: CAER) recently announced an upgrade that makes the OmniPage Pro optical character recognition (OCR) software available for an estimated street price of only \$129. This is an inexpensive way for scanner users to step up to fully-featured OCR products (including those bundled with flatbed and edge feed products) can upgrade to the full version of OmniPage Pro at a \$275.

OmniPage Pro has a separate upgrade package available through Computer City, Higdon, and Best Buy. Since the vast majority of Caere OCR, most scanner users are eligible to upgrade at this price.

The large number of scanner manufacturers that bundle Caere OCR (Microtek, Canon, Pustek, Umax, Nikon, Agfa, Logitech, Relays) are eligible for the upgrade.

The upgrade program includes OmniPage Pro 6.0 (Windows 3.1 and 7.0/Windows 95), which offer all the capabilities of the bundled software for extended functionality. Most notable among them are higher resolution scanning, the "Zoning" and preprocessing of scanned images, verifiers for the Page technology for the retention of the original page formatting, as well as OCR training and deferred processing capabilities.

The Changing OCR Market: In the not so distant past, OCR required hardware and OCR software that was often difficult to use and provided little time and money saving benefits it provides. These issues were frustrating and limited the use of OCR to high volume vertical markets. The use of desktop OCR was limited to the "early

"Today, several trends are contributing to the widespread use of OCR users faced," said Chad Kinzelberg, Caere's vice president of product development. "The program is another major factor that will promote the use of OCR. At the same time, even the occasional OCR user will find Caere software more attractive because it is so cost

Analysts following the OCR market agree that OCR use is on the rise and industry trends promoting its mainstream adoption.

Higher Customer Awareness: An increased number of computer users are realizing the time and money saving benefits it provides.

Higher Scanner Penetration: Scanners prices have dropped drastically in the last few years with many flatbed and edge feed scanners available for under \$500. Also, the use of small-footprint sheet-fed scanners and multifunction devices have entered the market.

Increased OCR Accuracy: OCR developers have developed high accuracy OCR technology for increased output. The greatest improvement has been made on degraded and hard to read documents.

Improve Your OCR and Save Big \$\$\$

Higher Scanner Penetration:

Scanners prices have dropped drastically in the last few years with many flatbed and edge feed scanners available for under \$500. Also, attractive, new scanners (sheet-fed scanners) and multifunction devices have entered the market.



Low cost scanners entering the market have helped push OCR use to a new level.

Increased OCR Accuracy:

OCR developers have developed high accuracy OCR technology for increased output. The greatest improvement has been made on degraded and hard to read documents.

Pricing and Availability

OmniPage Pro 7.0 (Windows and Mac) and WordScan Plus 4.0 (Windows) upgrade packages are immediately available at major resellers for an estimated street price of \$129.

The Company:

Caere Corporation, with U.S. headquarters in Los Gatos, Calif. and European headquarters, Caere GmbH, in Munich, Germany, is a leader in OCR technology and desktop document management products. Caere has recently expanded its product line of OCR

OmniPage Pro gives you almost twice the OCR accuracy with the same ease-of-use as OmniPage Limited Edition.

OmniPage Pro keeps text in its original format and layout, including graphics.

OmniPage Pro even outputs to HTML.

continued on next page

OmniPage Limited Edition

OmniPage Pro

Upgrade now to faster, more accurate OCR.

Sure, the OmniPage Limited Edition OCR that came with your scanner is good. In fact, that's why scanner makers like HP, Microtek and Agfa chose it above all others.

But if you want greater accuracy, full-throttle speed and a ton of new time-saving features, then it's time you moved up to OmniPage Pro®.

OmniPage Pro employs a new, more powerful OCR engine to recognize poor copies and degraded faxes.



It integrates seamlessly with your favorite applications like Word, WordPerfect and more. It even guides you through the OCR process using its AutoOCR Toolbar. All with the simple push of a button.

What's more, you get the advantages of the world's most popular OCR software without learning an entirely new program. So make sure you're getting all the OCR power and accuracy you deserve. Call now to upgrade, or visit a local reseller.

Key Feature Comparison	OmniPage Pro	OmniPage Limited Edition
Caere's fastest and most accurate OCR engine	✓	
AutoOCR Toolbar™ for easy, one-button OCR processing	✓	
OCR Wizard to guide you through the process	✓	
Integrates with most image editors like Photoshop	✓	
OCR from within your favorite applications	✓	✓
Retains original layout	✓	

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Pipeline

Peeling Out—With a PC

If Intel has its way, the next frontier for Pentium-powered multimedia applications may be your car. The company recently announced an initiative dubbed the "Connected Car PC"—complete with its own developers' conference and reference platform—for multimedia

access, mapping, and multimedia entertainment for passengers. Intel's reference platform supports the design of unique in-car hardware and is based on MMX-enabled Pentium technology, due in early 1997.

According to Intel officials, DVD (Digital Versatile Disk) technology will form the core of new car-based infotainment centers aimed at passengers. The company is also focusing on speech recognition apps.

Ironically, another family of applications Intel is encouraging focuses on

telephony-based security and safety. This family of security-focused applications will be targeted at calling for roadside assistance, tracking stolen vehicles, and enabling authorities to identify vehicles.

One has to ask: Do the PC-powered people depicted here look safer thanks to the PCs?



EYES ON THE ROAD: Intel aims to bring entertainment to the backseat and security applications to the front.

PC features in automobiles. Although GPS (Global Positioning System) mapping functionality is currently road-ready, Intel is aiming at many other applications.

Intel's initiative is a pitch to developers to come up with auto applications for wireless fax/e-mail, cellular phone, Internet

Online: Home for the Holidays

If you're planning on buying a new home PC, check out our exclusive interactive benchmark test and price/performance viewers and our interactive summaries of features. You can sort the results for all the systems evaluated in this issue's home PC story by whichever criteria interest you the most. Holiday shoppers should also take note of our online holiday gift guide.

AND THE WINNERS WERE... On November 18, *PC Magazine* handed out its Awards for Technical Excellence in a ceremony at the Comdex trade show in Las Vegas. Visit our awards gallery to see the winners and to get direct links to those Web sites.

ALSO ON THE WEB. Be sure to bookmark our new and improved NewsWatch page, where you'll find daily Trends reports, searchable archives of Trends stories from 1996, our daily NewsScan summary of computing headlines from national newspapers and magazines, and up-to-the-minute news headlines from the ZD Net News Wire.



"A PC is for people looking for something to do. A Java computer is for people looking to do something."

Sun Microsystems chairman, **Scott McNealy**, on the launch of the new Sun JavaStation.

Web Credit Cards

Francs, pounds, and Deutsche marks will soon travel more securely on the Internet, as Visa plans to put Secure Electronic Transaction (SET) technology to the test in 16 European countries.

Along with 38 European banks, Visa will begin a pilot program to provide secure electronic commerce to cardholders. Using SET-compliant software containing digital certificates, they'll be able to purchase goods and services from Visa merchants over the Internet with as much security as



is found in face-to-face credit card transactions.

Banks will provide merchants and consumers with Visa's encryption software, which will certify the identities of the parties involved in a transaction.

Globe-Trotting on the Web



Microsoft's latest foray into unexpected territory takes place in the travel-reservations business. Expedia (www.expedia.msn.com) is a library of fares, times, and travel information designed for one-stop travel shopping. You can book plane, car, and hotel reservations via credit card,

consult multimedia travel guides, and take multimedia tours that feature, among other things, a 360-degree view of the Grand Canyon. The service itself is free. On registration, you provide such details as seat preferences and frequent-flyer numbers.

Microsoft has also partnered with American Express to create a travel service for corporate intranets.



Pipeline

Standards for Streaming Media

In a move that could mean a big boost for real-time streaming multimedia on the Web, Progressive Networks and Netscape have announced that 40 companies—including Apple, Cisco, Hewlett-Packard, IBM, and Sun Microsystems—are supporting the Real Time Streaming Protocol (RTSP), an open standard for delivering real-time media over the Web. Microsoft, which was conspicuously absent from the agreement, announced a few days later that it has purchased a stake in VDO.Net, which uses its own proprietary standards for streaming media.

"RTSP will do for streaming multimedia what HTTP did for text and graphics publishing," claimed Rob Glaser, CEO of Progressive Networks. RTSP is not just a communications protocol targeted at audio, though; it's also positioned as a standard for real-time video and other kinds of multimedia, such as 3-D animation.



Microsoft's absence from the list of RTSP-supporting companies means that the standoff over streaming media standards may not be entirely over. Netscape clients and servers, for example, will traffic multimedia based on a different standard than Microsoft clients and servers will.

Still, one of the bottlenecks of moving the Web from static content to rich, multimedia content has been the lack of standardization, and RTSP's acceptance is one of the biggest steps yet toward widespread agreement.

Fanny-Pack PC

Forget about notebooks. The next time you have to leave your desktop, Xybernaut Corp. wants you to wear your PC.

Originally developed as a



hands-free computer for the U.S. military's repair and maintenance needs, the voice-activated, 3-pound Mobile Assistant isn't much larger than a CD jewel case. Inside, you get a 486 CPU, 16MB to 32MB of memory, and a 540MB to 1.2GB hard disk.

Using a lightweight headset that incorporates a gray-scale monitor, an earphone, and a microphone, you issue voice commands to navigate through a DOS, Windows, or SCO/Unix interface.

Plug-in PC cards allow two-way voice, data, and video communications. Xybernaut, in the midst of developing software toolkits for creating industry-specific Mobile Assistants, recently announced the Mobile Assistant II, a lighter, smaller PC with a Pentium/75 CPU. The company is also working on an architecture for mixing and matching such peripherals as Global Positioning System devices.

Pet Rock

Finally, there's a product that offers a high-bandwidth connection to the Web and makes the garden look pretty. Hidden inside what looks to be a common landscaping rock is an 18-inch personal satellite that receives Web pages at 400 Kbps. (Uploads—requests you make to the Web—are handled via modem.)

Mounted on your roof or concealed within this handsome 27-pound fiberglass boulder, the Hughes Network System Direc-PC satellite—which communicates with the Galaxy IV geostationary satellite—is faster and cheaper than

ISDN, is more real than cable modem, and



DISH COVER: This fake rock, from Rock-On, conceals a satellite dish used for Internet access.

delivers wireless Internet service to corporate networks. Geostat Communications, of Gilbert, Arizona, sells the satellite system and offers a complete PC package under the name Renegade Systems. The Rock-On line of simulated boulders—including smaller companion rocks—is optional.

Instant 3-D

Synthonics (www.synthonics.com) has come up with a way for you to create eye-popping, photo-realistic 3-D images in minutes—without having to go near a CAD program.

Using the company's Rapid Virtual Reality (RVR) technology, you take at least two photos of any object from different angles, digitize the photos, draw lines between congruent spots on the different views, and then watch as the software creates a 3-D wireframe of the object. The software overlays photographic detail back onto the wireframe, and voilà! You've created a 3-D image without using a CAD program or a 3-D rendering tool.

The technology is already used in the medical and product-design fields. The small file sizes make the software ideal for creating images for Web-based product catalogs.



VIRTUALLY REAL: Synthonics' RVR technology overlays photo-realism onto wireframes.

Retail Sales: Top CD-ROMs

- 1 **Microsoft Windows 95 Upgrade** Microsoft
- 2 **Warcraft II: Tides of Darkness** Blizzard Entertainment
- 3 **Mechwarrior 2** Activision
- 4 **Duke Nukem 3D** Formgen
- 5 **Corel WordPerfect Suite Upgrade** Corel
- 6 **Elder Scrolls 2: Daggerfall** Bethesda Softworks
- 7 **Print Shop Deluxe Ensemble** Broderbund
- 8 **Civilization II** MicroProse
- 9 **Myst** Broderbund
- 10 **VirusScan** McAfee

Source: PC Data. Data for September 1996

THIS ISSUE'S CONTRIBUTORS: Angela Hickman, Regina Kwon, Carol Levin, Sebastian Rupley, and Don Willmott.

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Since the mid-eighties, a color has seeped into the colorbooks and swatches of American interior design. But after a monochromatic decade, there's change on the horizon. 1996 will forever be known as the Year of Magenta.

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that's perfect
because our
dots don't
splatter. See?



PHOTO QUALITY

With Microdot technology and 720 x 720 dpi your documents won't just be smart, they'll be brilliant.

YOU'VE GOT TO SEE IT IN **EPSON** COLOR.



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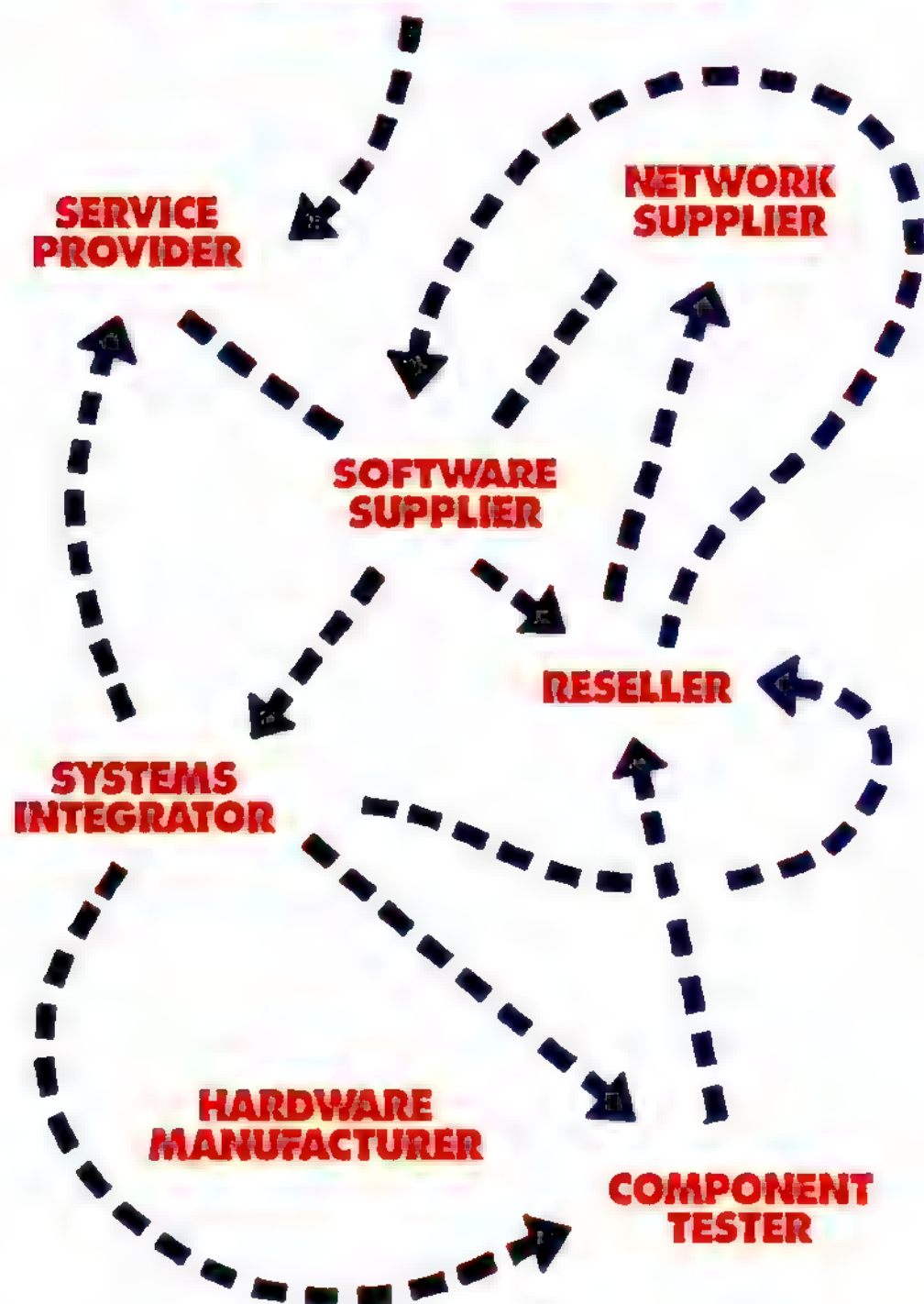
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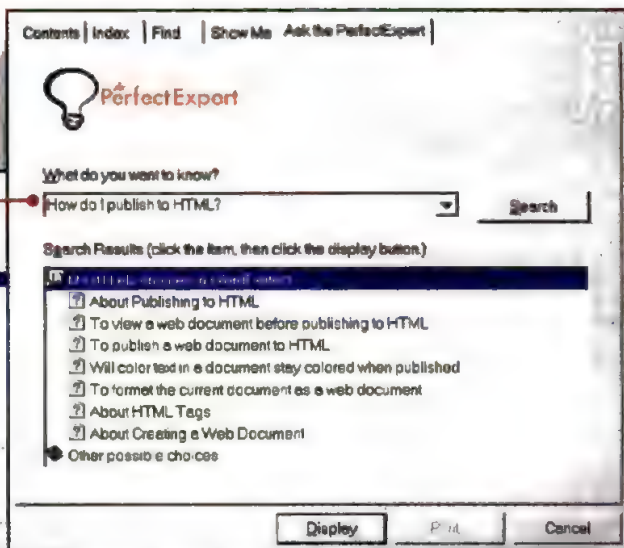
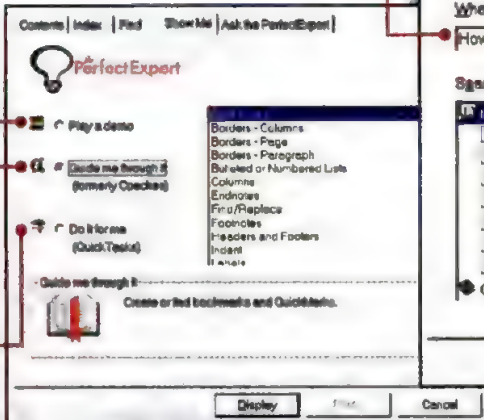


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Letters

ALL THOSE IN FAVOR

Clearly, John C. Dvorak never took Economics or Marketing 101 ("Software Dumping," September 24, 1996). Giving away software is not dumping; selling software well below cost in order to squash the competition is. Giving away software is an example of the classic ploy originally used by King Gillette: Pass out free razors and sell millions of razor blades. There's nothing illegal or unethical about it.

TIMOTHY E. HOOD
via the Internet

If Microsoft wants to give me free software, that's fine by me.

BILL RAWNSLEY
via the Internet

Internet Explorer belongs to Microsoft. If MS wants to give it away, throw it away, sell it for \$100 a copy, or lock it in a vault where no one will ever see it, that's the company's right. No one—not me, not Dvorak, not the U.S. government—has a right to force Microsoft to do differently.

BRANDON BLACKMOOR
Portsmouth, Virginia

Dvorak misuses the term *dumping* in his recent column. *Dumping* is pertinent only as it applies in international trade. It is used as a protectionist barrier in order to safeguard a domestic company from a foreign interest. Since both Microsoft and Netscape are U.S. companies, the term simply doesn't apply. He should have used the term *anticompetitive practices*.

LEONARDO COHEN QUEZADA
via the Internet

Poor, poor Netscape indeed. From day one, Netscape's marketing strategy has been based on what most would agree was the relatively successful Marketing Basics 101, as originated by Gates & Co. during the early 1980s. Netscape's recent letter to the Department of Justice was like the pot calling the kettle black.

DANIEL D. JOHNSON
via the Internet

Aren't a lot of businesses *dumping* now? There are so many Internet authoring tools available for free that it doesn't seem Microsoft is the only culprit.

JODE POLEY
via PC MagNet

I completely agree with Dvorak. There should be boundaries set for companies such as Microsoft—if not by the government, then by the software-developer community. Such



*"If Microsoft wants to
give me free software, that's
fine by me."*

regulations could tighten competition and consequently lead to better software and more freedom of choice for end users.

MAX SOKOLOV
via the Internet

COVER VIEWS

I loved your September 24, 1996, cover story, "Life Beyond Windows 95: NT 4.0 & OS/2 4.0." You presented a fair and unbiased comparison of the two leading 32-bit operating systems for the PC desktop. Not only did you give them each equal billing, but the articles were thorough and accurate. Please continue to give Windows NT and OS/2 Warp regular coverage.

RICHARD ENG
via PC MagNet

I just read your articles on Windows NT 4.0 and OS/2 Warp. Thanks for the fair and balanced treatment. Your improved coverage of OS/2 as a viable desktop operating system has not gone unnoticed.

BILL BEINERT
via the Internet

I'm writing to express my disgust with your cover story comparing Windows NT 4.0 and OS/2 Warp 4.0. I felt the whole issue was a large infomercial for Microsoft. I was surprised to find that in writing such a one-sided story, you failed to include the one feature that did impress me about Windows NT 4.0—that is, its cross-platform options for PowerPC, Sun, and IBM RISC hardware.

DAVID ZEE
via the Internet

As an avid OS/2 user and Team OS/2 member, I congratulate you on your recent cover story. My only complaint is with the comparison chart of operating systems, in which you incorrectly state that OS/2 Warp 3.0 require 8MB of RAM. I have run it on a 386DX machine with 4MB of RAM.

MATT VERMETTE
via the Internet

While OS/2 Warp 3.0 can run with just 4MB of RAM, OS/2 Warp Connect 3.0—the operating system we included in the comparison chart—does require 8MB of RAM. (This version of OS/2 includes some added connectivity features and the like.)—Ed.

PROMISES, PROMISES

I agree with many of the statements in Michael J. Miller's column "Unmet Promises" (September 24, 1996). Of course, computer vendors are coming up short, and many have made promises they can't keep. Realistically speaking, I think computers are still in their infancy. Just try to imagine what we'll be doing with our PCs 10 or 20 years from now.

MARC EDWARDS
via the Internet

GOOD BOOKS

Thanks for your coverage of some of the recent books on installing and maintaining Linux (First Looks, "Spreading the Linux Gospel," October 8, 1996).

CURTISS CLARKE
North York, Ontario, Canada

IS BIGGER ALWAYS BETTER?

I just read Jim Seymour's column "Why You Don't Use Windows" (October 8, 1996) and was surprised he didn't mention the use of multiple monitors. Since 1987 the Macintosh has supported the use of several adjacent monitors, each with its own video card, as a virtual monitor. You can have a different application on each screen, or use one screen to hold toolbar palettes, or even have a window spread across two screens. I would like to see this feature adopted by Windows-based computers.

TOM PECK
College Station, Texas

For a review of the Impulse Appian graphics card for PCs, which supports two or four monitors, see First Looks, May 14, 1996.—Ed.

Seymour is right on target with the need for more screen real estate. That's why I upgraded to a 17-inch monitor about a year ago. I was intending to run at 1,600-by-1,200 resolution.

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Letters

After I got the monitor and a new video card to support that resolution, I discovered that I had to use a virtual screen. I now run in a virtual 2,048-by-768 mode with 256 colors. This is a double-width screen on which I access applications simply by moving the mouse to the right or left screen boundary; a double-height mode is also available.

DAVE GLANDORF
Houston, Texas

Is bigger necessarily better? Why not suggest some of the many available options for virtual screens? Virtual screens have been around in the X Window world for quite some time. There are also many shareware virtual screens for the Windows 95 desktop. Why resign yourself to one 21-inch monitor when you can have a myriad of 15-inch monitors a click away?

MIKE WOHLGEMUTH
via the Internet

I agree with Seymour on this one. I've rarely seen anyone seriously use more than one window at a time; most people use multiple windows occasionally. Given today's monitors, I think there's a better solution than going to a 20-inch monitor. Personally, I'd much rather have two 17-inch monitors, or a 17-inch and a 15-inch, than one larger screen. Unfortunately, Microsoft doesn't seem to be inclined to include any real support for multiple monitors.

PHILIP TUBB
Golden, Colorado

HELPING OUT

PC Magazine could help promote more effective computing by reviewing video drivers

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CORRECTIONS AND AMPLIFICATIONS

In the sidebar "Don't Know HTML? These Might Convert You" in our September 10, 1996, "Web Authoring" story (page 133), the correct address for NetScene is www.net-scene.com.

Dow Jones Business Information Services' new software pricing is now available for the Dow Jones News/Retrieval online service mentioned in New & Improved, September 24, 1996 (page 75).

more aggressively. Graphics drivers, not monitors, are the real bottlenecks.

THOMAS E. BURTON
Encinitas, California

DLLS ON THE LOOSE

In his October 8, 1996, Inside Track column, John C. Dvorak addressed the problems with Microsoft's dynamic link libraries. In my opinion, he's 100 percent correct. Microsoft does indeed have a problem in tracking DLLs. During the last year I have had one hard disk failure and also have upgraded to a larger hard disk. Both required reinstalling Windows 95 from backup tapes. As a result, there were several files out of place, most dealing with DLLs or VXD's. I long for a good, dependable backup program for Windows 95.

DONALD J. MANGOLD
via the Internet

FLAME OUT

Regarding Jake Kirchner's October 8, 1996, column on flame mail, "Will Rogers Never Cruised the Net," all I can say is that somebody has to make the Internet safe for the rest of us. The solutions I can think of include Net servers that block reading postings or receiving e-mail from particular addresses.

GENE DOUGLAS
Lawton, Oklahoma

TOOL AND THREAD

Your October 8, 1996, review of news readers was disappointingly shallow. While Gravity certainly has some strong points, its instability, quirky interface, and complete lack of a workable MDI leave much to be desired. In my opinion, Forté's Agent still has the most flexible interface around.

PETER B. JONES
San Francisco, California

I've been looking for the perfect news reader for a long time and, although I have still to find it, I think I'm as close as I'm going to get with OUI 1.5. It's the only product I've tried that can access multiple news servers on the same pass and also remember which threads I've been following. Also, even though I don't have to keep track of my online time, I find OUI's two-pass style beneficial. I don't have to deal with slow response times when moving from one message to another. Thanks for the tip.

JON SHELDON
Thousand Oaks, California

HEY, THANKS

As a subscriber who reads every issue and likes the content, I'm here to say thanks. I really enjoy the many different topics, First Looks, Trends, and all the columns. Keep it up.

WILLIAM D. MCKINNEY
Dee Sign, Alaska

DAMAGE CONTROL

I found Bill Howard's October 8 column ("Deep Storage") interesting, and I agree with most of it. He may be right that SyQuest's EZ devices are based on "arguably better technology" than Iomega's Zip drive. On the other hand, there is no disputing that the Zip drive can take more punishment without damage than the SyQuest cartridge. That is very important with a transportable storage device.

GEORGE LITWINSKI
via the Internet

LEFT OUT OF THE GAME

I wanted to comment on your excellent article "Two or More Is War" (October 22, 1996). But you left out my personal favorite—Kahn. It provides all the features you could want, is faster (in my opinion) than its competitors, and works on most DOS- and Windows-based machines. I got my copy at www.teleport.com/~nbright.

DOUGLAS BOOM
Beaverton, Oregon

I was very disappointed to find that the Multi-Players Games Network (MPG-Net) was not included in your article on multiplayer gaming. We presently have the original MPG-Net, which is a DOS-based games network, and MPG-Net running under The Microsoft Network. Our newest network is MPG-Net Showcase for Windows 95 users, which is featured at our Web page www.mpgn.com.

MICHELE DIPERT
Director of Marketing Services,
MPG-Net
Key West, Florida

Kahn, which is very similar to Kali, is a relative newcomer to the world of multiplayer gaming and may be included in future roundups. MPG-Net, on the other hand, was not included in the story because it offers original-content games, and we only reviewed services that offered "the most popular action and strategy games on the market (such as Command & Conquer and Duke Nukem 3D)." —Ed.



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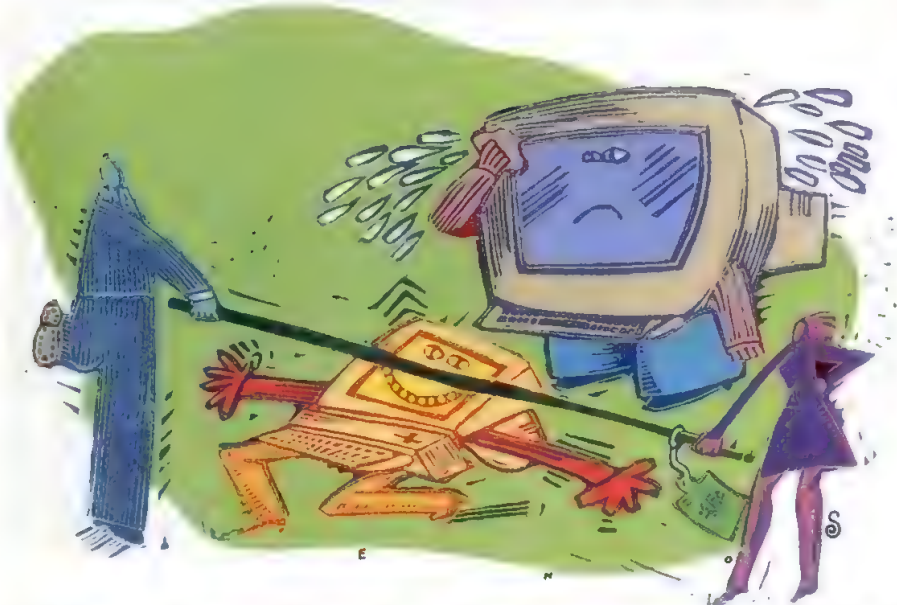
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Trends



The So-Called Network PC

The Microsoft NetPC and the Sun JavaStation go head to head.

Industry giants are fighting for the heart and soul of the computer of the future, and the outcome could change the face of corporate computing. The network computer is shaping up to be more than just a newfangled PC. It's suddenly become something of a Holy Grail for companies like Microsoft—with its NetPC—and Oracle and Sun Microsystems—with their network computers, or NCs.

Microsoft outlined plans for the NetPC just one day before Sun Microsystems introduced its JavaStation. Although there's no disagreement over the objective of network computers—sharply reducing the cost of owning a PC—a debate is boiling over as to the best route to take.

Originally, Oracle CEO Larry Ellison had targeted his \$500 devices primarily at home users. Now, developers across the board are positioning NCs as higher-priced corporate machines. And over the past year, while companies such as Oracle and Sun pushed the idea of network computers, Microsoft's policy had been to dismiss it. Now Microsoft has reversed its policy—at least partially.

In partnership with Intel, Microsoft recently unveiled plans for a new, under-\$1,000 NetPC, which is accompanied by a new Microsoft initiative called “zero administration.” NCs from companies like Oracle and Sun are designed to eschew Windows and Windows applications,

but the Microsoft NetPCs are targeted at corporations that want to stay with Windows. NetPCs will use standard components, including hard disks, Intel processors, and built-in modems. The locked-case devices will have limited expandability but will take advantage of new software promised by Microsoft. By automatically installing new copies of programs across the network whenever the operating system boots, the machines are designed to require significantly less upkeep than PCs now demand.

Compaq, Dell, Digital Equipment Corp., Gateway, Hewlett-Packard, NEC, Packard Bell, and Texas Instruments have endorsed the NetPC initiative, and Intel and Microsoft plan to lead a design review in early 1997. Microsoft critics have called the NetPC initiative a half-hearted effort to join the network computer bandwagon.

Meanwhile, at the debut of Sun's JavaStation, CEO Scott McNealy laid out his vision of the network computer and had no shortage of barbs for Microsoft. The subject of PCs is an explosive one for McNealy: “Compatibility is the great myth of the PC. . . . There's no such thing as a zero-administration PC.” His solu-

tion: the JavaStation. This lightweight, completely silent device—which looks more like a coffee maker than a computer—is notable more for what it doesn't have than what it does. You won't find a hard disk, a floppy disk drive, or a CD-ROM drive, but you will find a micro-SPARC II chip, 8 to 64MB of RAM, and an Ethernet connection. The JavaStation (\$742 for the basic model, without monitor, and \$1,565 for the top-of-the-line number) runs the Java operating system and Java applications from the server. Sun's software subsidiary, SunSoft, concurrently released a range of software with which applications developers can start building Java applications.

The machine pulls down your personalized desktop from the server, downloads the operating environment, and runs applications. You'll see Java machines embedded in every kind of computing device, from smart cards and supercomputers to pagers and phones. “This is a truly scalable environment,” Sun's McNealy said.

TWO VISIONS AT ODDS

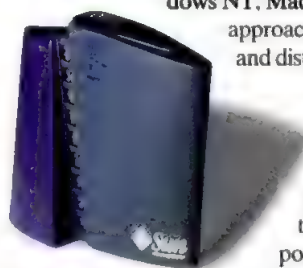
Microsoft and Sun share a philosophy of low-cost corporate computing, but their visions are at odds. The Microsoft NetPC bet is based on the idea that corporations want to “retain their investment in Windows,” says Microsoft's Paul Maritz. For Sun, Java's platform agnosticism is key. Since Java is a “write once, run many” language, developers can write one application that runs on any platform—that means not only JavaStations but also machines running Windows NT, Macintosh OS, and Unix. In both approaches, the server stores, manages, and distributes apps to clients as needed,

so network administrators needn't bother with multiple installations.

As for cost-of-ownership numbers, Sun's McNealy says that its JavaStation will cost corporations less than \$2,500 a year to maintain—compared with the \$5,000 per year necessary to maintain a PC. According to Michael Dell, CEO of Dell, however, “the industry

has seen a number of proprietary designs for network computers—[the NC is] a step backward that would require customers to support multiple computing environments, increasing support costs and complexity.”

Whatever the outcome, it's not likely to happen overnight, and, as McNealy says, “will require changes in strategy at the highest levels.”—Carol Levin and Sebastian Rupley



GOOD TO THE LAST DROP
The Sun JavaStation aims to minimize costs.

Chip Engineers Talk Shop

A showcase of cool breakthroughs.

Faster, smaller, cheaper—these are the main themes slated for this month's International Electron Devices conference on advanced chips. The San Francisco meeting brings together researchers from around the world who report on breakthroughs in the technology, design, manufacturing, physics, and modeling of semiconductors.



Chip Conference Highlights

NEC: 1Gb DRAM chip

Samsung: 256Mb flash-memory chip

Toshiba: cellular-phone-on-a-chip

TRW: 94-GHz power transistor

Among the topics on this year's agenda: The use of X rays to build the smallest memory structures ever; a manufacturing process that produces tiny, low-power devices; and a silicon power transistor that's so fast it may one day enable a cellular phone to be built on a single chip.

NEC researchers are showing off their work on the 1-gigabit (Gb) DRAM chip, which, by the year 2000, may let you store more than 100 books of text on a chip the size of a fingernail. And that's small potatoes compared with the 4Gb DRAM chips Toshiba researchers have in sight. When chips become that dense, the wavelength of visible light used in the optical lithography manufacturing process—a process similar to that of photography—is too large to print the fine lines required to connect all the components. So Toshiba is using X rays, which can print finer lines. Meanwhile, Samsung researchers are working on technology for building the highest-density flash-memory chip—256Mb. Unlike DRAM, flash memory doesn't lose data when power is turned off and is ideal for use in PC Cards, smart cards, and digital cameras.—Carol Levin



Got a Sluggish Home PC?

MANY HOME PCs COME LOADED WITH custom software interfaces, or front ends, that make the consumer's out-of-box experience a little less befuddling. On boot-up, many front ends load a variety of user-friendly applets. That's the good news. But it turns out that front-ends are often as much of a drag on system resources and performance as they are friendly. That's the bad news.

With this in mind, we recently put several home PCs to the test. PC Magazine Labs tests systems as they are shipped from the manufacturer, with only a few minor configuration changes. With the home PCs we tested for "High Style, High Speed" (in this issue), we decided to run our new ZD Business Winstone 97 and ZD Business Graphics WinMark 97 benchmark test suites by switching out of the systems' front ends altogether and into Windows 95.

We had some good reasons for trying this. On some systems, we were unable to run the benchmark tests at all with the manufacturers' user-friendly applets loaded in memory. Yet in other cases, the benchmark tests ran fine with the applets loaded. We could have chosen to delete troublesome applets selectively, but this would have resulted in multiple configurations across the different systems. Using the systems that permitted us to run tests both with and without the front ends loaded, we were able to determine the impact of front ends on system performance. Based on our testing, some of the systems exhibited slower performance with front-end applets loaded.

For a reality check, we could have re-formatted entire drives and then run the benchmark tests, but that would have pinned down unrealistic results from users' perspectives, and it also would have affect-

ed our reviewers' ability to experience the systems as our readers do—exactly as they are shipped from the manufacturer.

FRONT-END COMPROMISE

As we proceeded to benchmark-test the home PCs, we encountered an unusual problem. We didn't want to dispense completely with the front-end interfaces or applets, because those are essential components of the qualitative part of the review of any home PC. Yet we can't test uniformly in every case with front-ends loaded, because the benchmark tests simply won't work on some systems. What to do?

We decided to exit all front ends and disable all applets prior to running performance

tests, but we kept all the applications loaded on disk, as shipped. After we ran the performance tests, our reviewers were able to re-enable the front ends for further evaluation. We also disabled—for performance-testing only—any AUTOEXEC, CONFIG, .INI, and Registry files that could possibly start up an applet.

Some will argue that our approach doesn't represent the reality for home PCs, because we won't uniformly tell both the performance and the qualitative stories of systems slowed down by front ends. Our compromise: test performance under similar conditions, with front ends and applets disabled. We expect that any users who demand high performance—the same users who would run performance tests—would rarely use front ends. But we didn't completely remove the front ends and applets, because the reason the software is bundled in the first place is to enhance the user's experience. All of which just goes to show that balancing the qualitative with the quantitative is the tricky part of testing products.—Nick Stam



INTERFACE ENHANCERS: Friendly front ends can impact system performance



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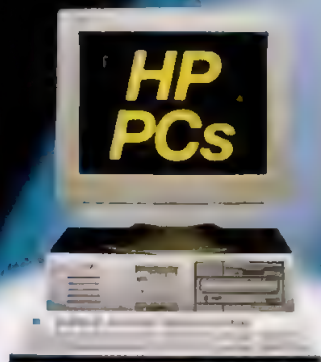


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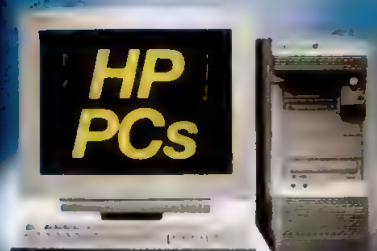


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Write CDs, then Rewrite Them

New CD-RW brings rewritability to CDs.

First there were readable compact disks. Then came writable disks. Now, get ready for rewritable disks. Hewlett-Packard, Mitsubishi, Philips, Ricoh, and Sony recently agreed on a new standard to bring rewrite capabilities to CD drives and demonstrated prototype drives designed to use the new disks.

CD-RW disks are based on the new Universal Disk Format (UDF), Version 1.5, which the Optical Storage Technology Association just completed. A major advantage of this widespread standard is support for packet writing, an approach that adds data incrementally to the disk. Any buffer underruns (the bane today of CD-R) result in bad sector marks, but writing continues without trashing the whole disk. CD-RW disks function exactly like hard or floppy disks, so you can defragment and optimize

data just as you do with those other formats.

With DVD (Digital Versatile Disk) delayed, CD-RW—a new rewritable disk based on phase-change technology—is positioned as a bridge solution. A CD-RW player, a DVD-ROM device, and a new generation of

ibility with existing compact disk-recordable (CD-R) disks? The new CD-RW players will read from and write to CD-R disks but won't write over information already contained on them.

Developers expect to deliver CD-RW drives with adapter cards and software for under \$1,000 by late in the first quarter of next year; prices are expected to drop to about \$500 by the end of 1997. The new CD-RW disks start at a relatively high \$25. The first wave of drives will write at 2X and read at 6X.

"Users have been clamoring for high-capacity storage devices that use rewritable media," says Colorado Memory Systems' John Boose. Still, CD-RW won't be for everyone. For near-line storage or for transferring master files to a service bureau, the cost benefit of using CD-RWs over standard write-once disks would occur only after several hundred transactions. Until DVD appears in volume, though, CD-RW is gaining backers.—Steve Buehler



WRITE-MANY CDS: The CD-RW format breaks the long-standing barrier to rewriting data onto CDs. HP, Mitsubishi, Philips, and Ricoh have shown prototype drives.

"multiread"—enabled CD-ROM drives now under development can all read the new CD-RW disks. And what about backward compat-

JAKE KIRCHNER

WebTV and Other PC Wannabes

I heard once that the perfect machine would be one that had no moving parts. If that's the perfect machine, I guess the *ultimate* machine would be one that has no moving parts and is free. I fear the only downside to the deal would be that the ultimate machine probably wouldn't do anything.

The electronics industry has yet to produce that elegant, free, do-nothing machine, but it's getting closer. Consider, for instance, the inexpensive new WebTV devices making such a splash this holiday season. The first comers are the Philips Magnavox Internet TV Terminal and the Sony WebTV Internet Terminal. Both are low-cost (about \$300) boxes that connect to your TV and telephone line to give you easy access to the Web, using a hand-held remote control or optional keyboard.

Of course, Web terminal buyers also need to sign up for Internet access, which costs about \$20 a month through WebTV Networks, a company that helped develop the Internet terminal concept and technology.

The question, then, is whether it's worth \$500 or \$600 to buy a terminal to get on the Internet for a year. A while back I wrote that I couldn't recommend that anyone spend \$2,000 to buy a PC just to get Internet access. The Internet terminals are a better deal and are probably worth the money—if Internet access is all you really want. But bear in mind that Internet access is all you really get for your basic \$300 purchase.

Yes, the terminals and WebTV service offer e-mail, but the on-screen keyboards for drafting messages are so ridiculously primi-



tive, you'll want to pay for the optional keyboard. Yes, you can add a printer and other devices via PC card slots, but pretty soon you'll have built a PC out of spare parts and still have a less capable machine than the most basic PC available today.

Despite the terminals' limitations, early sales reports have them moving briskly off the shelves of the many electronics and computer retailers carrying them. The monster advertising campaigns behind the machines are no doubt generating a lot of consumer interest during this holiday season, but it's too early to say how much staying power the Internet terminals will have.

Philips argues that there are 40 million folks out there who won't buy PCs but would like to be on the Internet. That's a big market, but it's also a market that's hotly contested. The computer companies aren't giving up on those buyers and are hoping that lower-cost PCs and the various new network computers and NetPCs will snare some of those dollars.

Every month new alternatives to PCs are hitting the market. These alternatives do one or two things well and don't cost much, but long-term, it's hard to see how much of a bargain they really are. If you start adding up the costs of Web terminals, video-game players, DVD devices, and all the optional keyboards, printers, joysticks, and other add-ons, it's hard to see how you're going to save money or be any better off than if you buy a low-cost multimedia PC.

But that's the consumer battle that will be fought over the coming years. Guard your wallet well.

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from **\$2,200***



HP OmniBook 5500



*Canada (US\$1,600-307,306) *Average US street price. Datapro Information Services Group, 1996 International User Ratings Survey of PCs. Pentium and the Intel logo are registered trademarks of Intel Corporation. © 1996 Hewlett-Packard Company. HPQ436

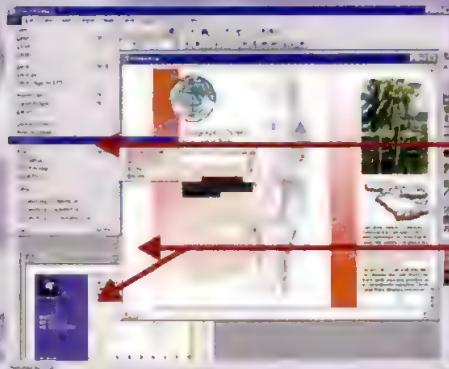
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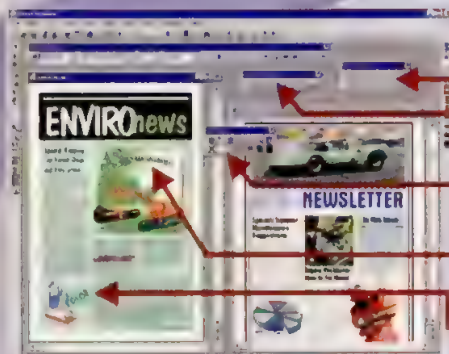
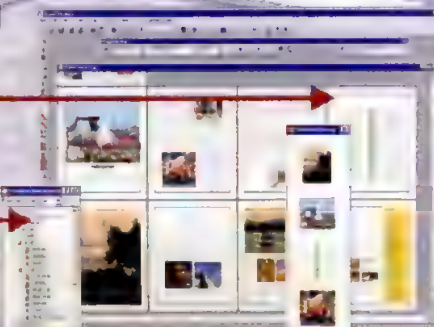
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Work in a multi-document environment.

Work on multiple pages and drag and drop items between pages.

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Corel VENTURA™ 7 can help you create any type of document, regardless of its size. Finally, you can create complex, multi-chapter manuals with automated ease. Eye-catching brochures filled with colorful pictures are no longer wishful thinking. With Corel VENTURA 7, your publications will be exceptional, from start to finish.

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- Artistic text that shapes to a path
- Object rotation in 0.1 degree increments
- Automated list generation
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- Conditions
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- SGML
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Collaboration has never been easier. When you need to work together, Corel VENTURA 7 has everything you're looking for, and more!

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PDA'S

Windows CE Inspires a New Generation of Hand-Held PCs

If you loathe the task of exchanging data between your PDA and your PC, relief is at hand in the form of Microsoft Corp.'s new operating system, **Microsoft Windows CE**. Call it Windows 95 lite: Designed for a new breed of PDAs billed as hand-held PCs, this 32-bit OS (code-named Pegasus) features sophisticated connectivity, including a built-in Web browser.

One of the first Windows CE products out of the gate is the **Cassiopeia** from Casio Computer Co. (201-361-5400, www.casio.com). The **Cassiopeia** is priced to sell: The Model A10, which comes with 2MB of RAM, will sell for less than \$500, while the Model A11, which includes 4MB of RAM, will cost under \$600. The device has a 4 1/2- by 2 3/4-inch backlit monochrome touch screen, a small but usable QWERTY keyboard, and a stylus.

The Cassiopeia comes with



productivity and connectivity software and can be used to download, store, and transmit images taken with Casio's QV-10 digital camera. A small, slide-in docking station option for connecting to your desktop is also available.

NEC Computer Systems is also

entering the Windows CE fray with its **MobilePro** hand-held PCs (800-388-8888, www.nec.com). The \$499 **MobilePro 200** comes standard with 2MB of RAM, while the \$649 **MobilePro 400**

of flash memory as well as a Type II PC Card slot and serial and IrDA-compliant infrared ports. The units link with a PC via serial cable or the MobilePro cradle docking device.

Philips Mobile Computing Groups' unique **Velo** has a sleek industrial design and uses a customized MIPS R3000 CPU (212-850-5000, www.philips.com). The Velo features an internal modem. Instead of a PC Card slot, the Velo will use Miniature Cards, which are smaller, lighter, and easier on batteries. The internal modem contains a retractable RJ-11 jack for connecting on the go. Prices will range from \$599 to \$739.

Although it is not a Windows CE system, another interesting product is the \$399 **Zaurus ZR-3000** from Sharp Electronics Corp. (800-237-4277, www.sharp-usa.com). The 11-ounce unit features a small QWERTY-style keyboard, a 320- by 240-pixel touch screen, serial and infrared ports, and 1MB of memory. The unit offers an interface for accessing CompuServe as well as Zaurus Mail e-mail; a fax modem is optional.—Robert S. Anthony

NOTEBOOKS

Value to Go

The extravagant notebook of the past is now the affordable, value notebook of the present: \$3,000 now buys a 120-MHz Pentium with an 11.3-inch or larger active-matrix display and about 1GB of data storage.

Samsung Electronics America (201-229-4000, www.sosimple.com) has replaced its SENS 800 line of value notebooks with the **SENS Pro 500**. These sleek, slate-blue multimedia notebooks start at \$1,899 for a system with

a 100-MHz Pentium CPU, 8MB of EDO DRAM, a 1.08GB hard disk, and an 11.3-inch SVGA dual-scan display. For \$2,999 you get a notebook with a 120-MHz Pentium CPU, 16MB of EDO RAM, a 1.44GB hard disk, a 12.1-inch active-matrix display, and an optional modular 6X CD-ROM drive (\$200).

The SENS Pro 500 systems weigh in at under 7 pounds and feature 256K of pipelined-burst L2 cache, an IrDA infrared port, integrated stereo speakers, and 16-bit audio. Configurations with 133-MHz Pentium CPUs are due by year's end.

Similarly, Digital Equipment Corp.'s entry-level **HiNote VP 500** line starts at \$3,000 for a system with a 120-MHz Pentium CPU, 8MB of RAM, a 1.08GB hard disk, a 128-bit graphics accelerator, and an 11.3-inch active-matrix display (800-642-4532, www.pc.digital.com). Also in-

cluded is a removable 6X CD-ROM drive that plugs into a modular expansion bay. The bay can hold either the CD-ROM drive or the 1.44MB floppy disk drive. Alternatively, you can graduate to a 133-MHz Pentium CPU and a 12.1-inch display for \$700 more, or downgrade to a dual-scan 11.3-inch display and save \$500.

A recent entry in the notebook arena from Hitachi (800-448-2244, www.hitachipc.com)

is the **E-Series** mobile line, which includes a \$2,000 100-MHz Pentium with 8MB of RAM, and a \$3,000 133-MHz Pentium with 16MB of RAM. Each 5.8-pound system comes with a U.S. Robotics 28.8-Kbps PC Card fax modem, a 128-bit NeoMagic graphics accelerator, a nickel-hydrate battery, and an 11.3-inch display; a dual-scan display comes with 100-MHz system, an

active-matrix display with the 133-MHz system.
—Cade Metz



TAKE IT WITH YOU: Value notebooks from Digital, Hitachi, and Samsung.

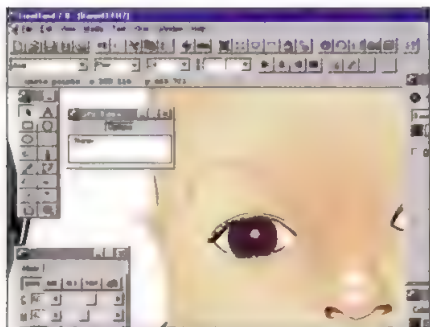
RECAP

The value line Editors' Choice selections in our August 1996 review of Pentium Notebooks were the

- ▶ AST Ascentia J50
- ▶ Austin Edge CD
- ▶ WinBook XP5 P100

ILLUSTRATION

Designs on the Future



ARTISTIC LICENSE: Macromedia's Freehand Graphics Studio 7.

From Internet functionality and enhanced color features to stronger integration with other graphics tools, the latest upgrades to illustration packages are now addressing the evolving needs of the artistically inclined.

Corel Corp.'s \$695 **CorelDraw 7** (800-772-6735, www.corel.com) optimizes Corel's popular graphics package for the Microsoft Windows 95 and Windows NT platforms. This upgrade takes Internet integration to a new level. It offers an Internet toolbar and Corel's Barista technology, which takes standard HTML one step further by letting you create such things as animation sequences and scrolling text. You can also assign a URL to any object, publish your CorelDraw documents to the Internet as either HTML or Java files, and easily construct text-only versions of your pages to accommodate people who don't want to wait for the graphics to download.

CorelDraw now lets you work with bitmap images and convert vector objects to raster format without using Corel's included Photo-Paint. CorelDraw also comes with CorelTutor, which has a step-by-step guide for 50 tasks, a ShowMe button that walks you through any of those tasks, and tools for interactive blends, fills, and transparencies.

With the \$450 **Freehand Graphics Studio 7**, Macromedia

(800-470-7211, www.macromedia.com) is targeting Adobe Photoshop users by providing drag-and-drop compatibility for moving elements between Freehand and Photoshop, as well as support for Photoshop files (Version 3.05 and earlier).

You'll also find additional tools for color management—including support for ICC (International Color Consortium), color

management profiles for monitors and scanners, and six-process color printers. The product also features cross-platform compatibility and the flexibility to read and write multipage PDF documents.

The Freehand CD-ROM includes Macromedia's Shockwave for Freehand, which allows you to compress native Freehand documents and make them viewable in browsers equipped with the Shockwave plug-in. From within your browser, you can zoom in on these files, which remain resolution-independent and can also act as image maps.

Deneba Software (800-622-6827, www.deneba.com) introduces 150 new features and a simplified interface in its \$599.95

crossplatform package, **Canvas 5**. The program has customizable settings and toolboxes, organized fills, multicolored gradients, true transparency, publication templates, and comprehensive type palettes similar to those found in Photoshop 2.5. There's also a variety of full-blown painting abilities. Canvas 5 also combines enhanced vector and bitmap art.

Stay tuned for more news from the illustration front: Adobe Systems is due to release its latest version of **Illustrator** by mid-1997.—
Yvonne Koulouthros

RECAP See our First Looks reviews of CorelDraw 6 and Freehand, Version 5 in the issues of April 9, 1996, and November 7, 1995, respectively.

LEGAL

Navigating The Law

Whether you're an individual trying to make sense of the tangle of legal terms and procedures or a legal professional trying to improve your workflow, there's something for you in the new crop of personal and professional legal programs.

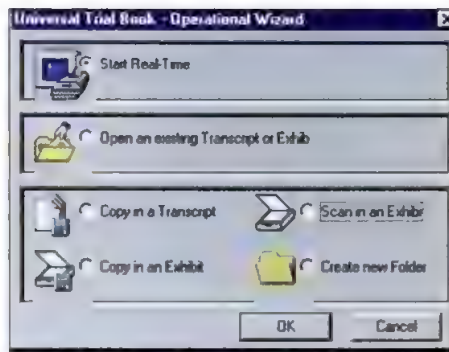
Targeting small businesses is McGraw-Hill's \$29.95 **Small Business Lawyer** (800-262-4729, www.pbg.mcgraw-hill.com/newmedia). This CD-ROM cuts through the legal paperwork by providing 323 customized legal forms and agreements that cover everything from power of attorney, partnerships, loans, and securities to real estate, leases, and the sale of business assets. After installing the program, you fill in your company's information. Small Business Lawyer can then generate a variety of legal documents with your company's specifics automatically entered. The program prompts you for any additional information it needs to complete the form.

Whereas McGraw-Hill provides instant access to legal doc-

uments, Nolo Press' \$35 **Small Business Legal Pro Deluxe** (800-992-6656, www.nolo.com) offers legal information that's relevant to owners of small businesses. The CD-ROM includes the complete, fully searchable text of four best-selling Nolo Press books, which together address

available on the Internet. You'll also want to check out Nolo's Web site, which is a clearinghouse of information and links related to the law.

Managing the myriad of documents, transcripts, and exhibits pertaining to a legal case can be mind-bending. Gigatron Software Corp.'s \$995 **CaseBook** offers a complete litigation support, imaging, and document-management solution targeted at legal professionals (800-999-9199, www.gsclion.com). CaseBook interacts with computer-aided transcription (CAT) systems to give lawyers immediate



TRIAL ORGANIZER: Gigatron's CaseBook.

a wide range of legal issues faced by small businesses. You will also find 50 fill-in-the-blanks legal forms, business letters, and contracts.

Legal professionals and the lay-person alike will find a useful companion in **Law on the Net**, another title from Nolo Press that was previously offered online via America Online. This \$89.95 CD-ROM is updated quarterly and provides links to and descriptions of thousands of legal resources

access to a transcript even if it's still a work-in-progress, while a bookmarking feature lets you locate a specific section of the transcript with one keystroke. Images may be scanned or imported into the Twain-compatible CaseBook, and the software supports OLE and many popular file and graphic formats. You can annotate transcripts and exhibits without altering the original, and you can search through transcript text and annotations.—*Melissa J. Perenson*

Trends Peripherals

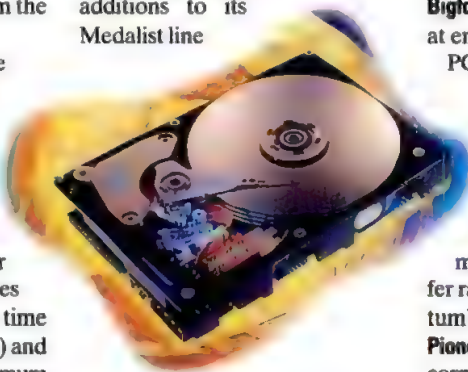
HARD DISKS

You've Come a Long Way

This past September marked the 40th anniversary of IBM's introduction of the Rochester random-access magnetic disk drive. That first 5MB system used 24-inch platters. That's a far cry from the latest hard disk offerings.

For starters, IBM's Storage Systems Division (800-426-2468, ext. 30, www.storage.ibm.com) has unveiled the \$449 **Deskstar 4**, a 3.5-inch ATA-3 or SCSI drive that crams 4.3GB of data into a one-inch-high, three-platter design. The 5,400-rpm drives boast a 9.5-ms average seek time (8.5-ms for the SCSI version) and an impressive 5.1-MBps minimum sustained data rate. IBM is targeting these entries at the performance PC market. Look for a 6.4GB, four-platter Deskstar 5—tentatively priced at \$575—by mid-1997.

Hard disk giant Seagate Technology (408-438-8111, www.seagate.com) is concentrating on the affordable desktop PC arena. The company has two additions to its Medalist line



THE BIGGER, THE BETTER: Seagate's Medalist series of hard disks.

of 3.5-inch drives. The four-platter **Medalist 3240** delivers 3.2GB of capacity, while the **Medalist 4340** puts

4.3GB on four platters. The 4,500-rpm Fast ATA-2 drives deliver a 12-ms average seek time and a sustained data transfer rate of 3.5 MBps. The drives will range in price from \$350 to \$425.

Meanwhile, Quantum Corp. (800-624-5545; www.quantum.com) has expanded the capacity on its 5.25-inch form factor **Bigfoot CY** family of drives targeted at entry-level home and business PCs. Available in 2.1GB (\$225),

4.3GB (\$310), and 6.4GB (\$395) Fast ATA-2 configurations, these 3,600-rpm drives deliver average seek times of less

than 14 ms and a claimed minimum sustained data-transfer rate of about 7.2 MBps. Quantum's more traditional 3.5-inch **Pioneer SG**, targeted at SOHO and corporate desktops, is now available in 1GB (\$180) and 2.1GB (\$235) capacities. These drives deliver 12-ms average seek times with a claimed minimum sustained data transfer rate of 8.6 MBps. —Jamie Bsales

UPSs

UPS Surfing



WEB HELPER: HP's Web Assistant.

What do the Web and uninterruptible power supplies (UPSs) have in common? Everything, if American Power Conversion Corp. and Hewlett-Packard have anything to say about it. Both companies are offering Web-based UPS management tools that let system administrators check on and control their network's UPSs from anywhere through the use of any Web browser you choose.

Hewlett-Packard Co. (800-533-1333, www.hp.com) was first off the block with Web capability for its **PowerWise Assistant** software, which is included with the company's PowerWise line of UPSs. With the plug-in running on a Microsoft Windows NT or Unix network server, administrators can use any Web browser to get a real-time view of the server's status and the UPS's settings; no additional software is required on the client PC. You can change settings remotely and have the software notify you in the event of a blackout.

APC (800-877-4080, www.apcc.com) has added similar functionality to its **PowerChute plus** software. In addition to browser-based administration tools, PowerChute adds WebAlert, a special feature for Web servers that notifies Internet and intranet surfers if the server they're logged on to is about to shut down. —JB

LCD PANEL MONITORS

LCD Monitor Elegance

LCD panels won't be replacing the cathode ray tube monitors accompanying most desktop PCs anytime soon, because the cost of LCD panels generally remains prohibitive. Active-matrix, color LCD monitors, however, are making inroads into such niche markets as medical imaging and trading floors. And bigger, brighter screens at lower prices are on the way.

Sceptre Technologies (800-788-2878, www.sceptretech.com) has rolled out new members of its **LCD Flat Panel Monitors** family. The 1,024-by-768-capable, 14.5-inch and 15-inch (measured diagonally) displays weigh a mere 8 pounds each and are just 2 inches thick. Prices range from \$3,295 to \$4,695, depending upon whether you

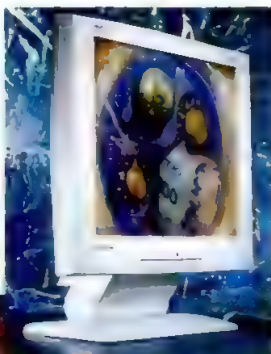


FLAT AESTHETICS: The NEC, Sceptre, and ViewSonic (left to right) color LCD monitors.



get the analog or digital version. You can use these displays either free-standing on your desktop or mounted on the wall.

Expect to see more mainstream monitor makers testing the waters too. ViewSonic Corp. (800-888-8583, www.viewsonic.com) is now offering the Lucid line of LCD monitors. The **PV140 ViewPanel** (pricing was unavailable at press time) delivers up to



1,024-by-768 resolution on its active-matrix screen, which has a 14-inch viewable area

If you're willing to live with a smaller screen, there's Iiyama's \$3,000, 12-inch **ProLite 31** and \$3,200, 13.3-inch **LP1013** (800-394-4335, www.iiyama.com). Both deliver 1,024-by-768 images. Meanwhile, market pioneer, NEC Technologies (800-632-4636, www.nec.com), has rolled back prices on its 12-inch **MultiSync LCD 200** and 13-inch **MultiSync LCD 300**, to \$2,999 and \$4,999, respectively. —JB

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Introducing the HITACHI E SERIES.

It's pretty clear what the rules are now: 1. If you stand still, you lose. 2. Your office isn't some set place. It's wherever you have to be to do your job. 3. Being away is no excuse for not being on top of it. A daunting state of affairs. Unless you're properly equipped—with Hitachi Mobilized Computing™ technology.

The latest manifestation of the concept is the Hitachi E Series notebook. Since futzin' with computers is not what you want to do

in the far reaches, our array of communications software comes pre-configured.

And the integrated 28.8 U.S. Robotics® modem, being an industry standard, comes

ready to connect you glitch-free to anywhere via the Net, online services, or two-way fax. Meanwhile,

we never ask you to sacrifice utility for mobility.

The slim E Series case is packed with critical features, as you can see at a glance in the box below.

There is one thing, though, about the E Series that's not out there: The price, starting at just \$1999,* a notably excellent value. Thus adhering to standing rule 4, don't blow your money.

There was a time in business when you were expected to drag your way to the top. The idea behind Mobilized Computing is that you should just cruise there.



HITACHI E SERIES: Significant Features

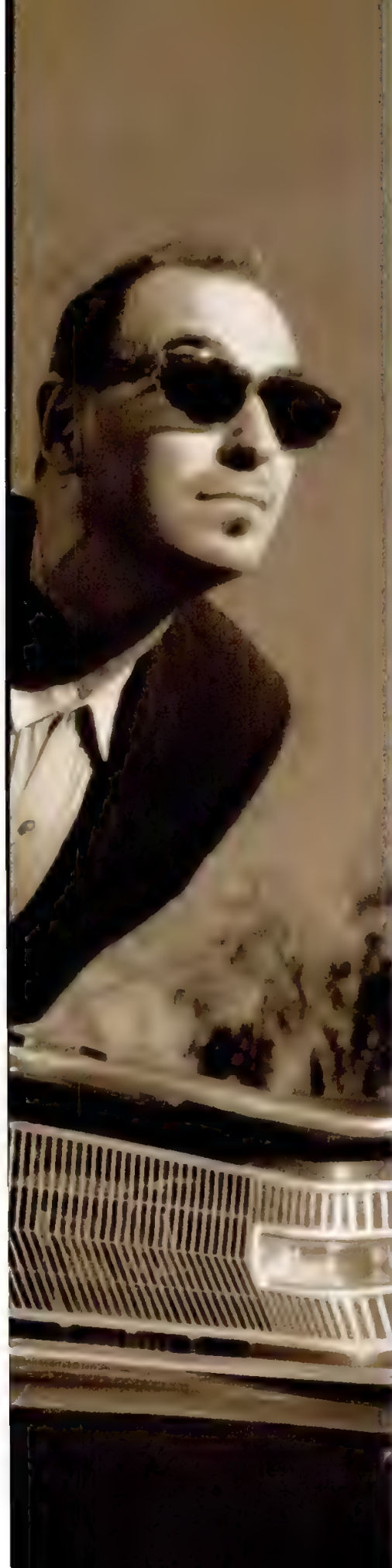
Intel Pentium® processor of up to 133 MHz
U.S. Robotics® 28.8 high speed modem
Large (11.3") high resolution screen
Removable hard drive for security & upgrades

Super fast graphic accelerator for dazzling presentations
Floppy drive swaps for second battery, effectively doubling power duration.

*Estimated street price. Dealer prices may vary. ©1996 Hitachi PC Corporation (USA). All rights reserved. The Hitachi E Series, Mobilized Computing, and Remote Control are trademarks of Hitachi PC Corporation (USA) which may be registered in some jurisdictions. The Intel Inside Logo & Pentium are registered trademarks of Intel Corporation. All other marks are owned by their respective companies.

Remote Control

CIRCLE 082 ON READER SERVICE CARD



ONLINE CONTENT DELIVERY

Personal Webcasting

Even though many people tout the Web as the next TV, finding what you want on the Web has so far been an exercise in frustration. Two new services combine the concepts of off-line browsing with PointCast's delivery model to bring content to your desktop without any effort on your part.

BackWeb Technologies (800-863-0100, www.backweb.com) offers **BackWeb**, a free client that extends the TV metaphor by having

BackWeb arrives at your desktop in what the company calls InfoPaks. Information can assume a variety of forms, from a content-rich screen saver to desktop wallpaper to audio messages and multimedia InfoFlashes, which display the latest news on your computer screen.

The BackWeb client downloads these InfoPaks gradually while you're connected to the

THE BIG SQUEEZE: BackWeb lets content providers deliver information in creative ways.



each content provider occupy a different channel. Channel owners transmit content using a BackWeb server (prices range from \$10,500 to \$100,000 annually depending on the volume of monthly deliveries). The client is available for download from BackWeb's site.

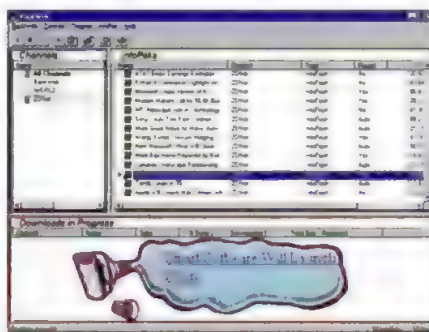
Content that's delivered by

Internet but not actively using the connection. According to the company, the download process doesn't interfere with your system performance or surfing speed, and any interrupted downloads are automatically resumed when you go online again. You can specify which channels are active, which

content you wish to view, and how much disk space each channel can occupy on your hard disk.

Currently, Gamelan, General Motors, iWorld, Open Zone, and ZDNet offer BackWeb channels, and Infoseek and *The Wall Street Journal* have announced plans to do so as well.

NETdelivery Corp.'s **NETdelivery** system also works to bring content to your desktop (970-221-3377, www.netdelivery.com).



NETdelivery has the same client/server approach as BackWeb, and it's platform- and browser-independent. The NETdelivery client is free, as are the tools for publishing content. Publishers pay a fee ranging from 1 to 4 cents per delivered item per person; volume



is measured monthly. Marketers who want to use NETdelivery to sell products or services pay a percentage of revenue to NETdelivery.

NETdelivery lets you design your own user profile, so you can customize the information you'd like to receive and avoid junk mail. Your information isn't given to the marketers and publishers using NETdelivery unless you specifically choose to give it to them. A mix of publishers and marketers will use NETdelivery to broadcast to Web users. Inc. Online, Interactive Week, and Yahoo! are just a few of the publishers already utilizing NETdelivery; Insight Direct and Lands' End are two of the leading merchants involved.

The success of these products ultimately relies on major content providers using these technologies to deliver information to interested parties. The technology to do so, from BackWeb and NETdelivery, appears ready to deliver.—David Lidsky

ELECTRONIC COMMERCE

Small Businesses Get a Big Security Boost

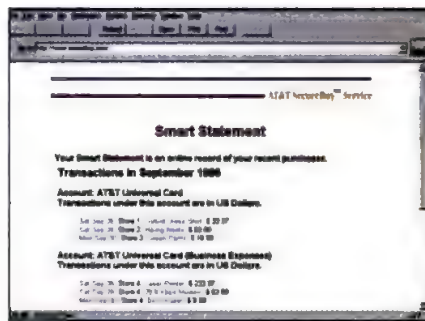
Speeding the growth of the online consumer market are Internet services and software that are making secure Internet commerce and delivery features a reality.

AT&T's **SecureBuy** service is renting out Internet storefronts housed on the AT&T site for between \$395 and \$595 a month (800-746-7846, www.att.com/easycommerce/securebuy). The service guarantees the integrity of all transactions through a user registration process that designates its authorized users as SecureBuyers.

SecureBuy accepts and tracks orders, approves credit card

purchases, calculates sales tax and shipping charges, and generates digital receipts. If for some reason an order is lost, AT&T credits the merchant for up to one month's rent. SecureBuyers need not worry about the safety of their credit information, as all personal data is maintained in AT&T's private database; even the merchants don't have access to buyers' credit card information. The service is fully integrated into AT&T's WorldNet Services.

Electronic commerce efforts have for the most part been un-



SMART STUFF: AT&T's SecureBuy service.

able to automate the fulfillment of orders. This is an area where shipping behemoth Federal Express can leverage its strengths. **FedEx BusinessLink** (800-463-3339, www.fedex.com) gives merchants with online catalogs the ability to ship their wares anywhere in the world with ease.

With an expected launch in early 1997, the service provides

businesses with software to create and maintain an Internet storefront. FedEx offers a complete solution for designing and building a site from the ground up, offering, among other things, a customized Microsoft Windows NT server and hardware package for printing labels.

When you place an order, the program generates a FedEx shipping label and a bar code. The product can then be delivered overnight automatically. In addition, both the business and the customer can track the product's whereabouts at no charge by using FedEx PowerShip, which is available on FedEx's Web site.—Jeremy Olshan

ROAD WARRIOR ALERT

KING OF THE ROAD

THE NEW TRAVELPRO 2000

The first 13.3" color display notebook from AMS Tech

When it comes to screen size everyone agrees— "bigger is better." Well stand back and make way for what may be the best notebook computer around. Introducing the TravelPro 2000— with a display screen so big it's earned the nickname King of the Road.

Just lift the lid on the TravelPro 2000 and behold. The spacious 13.3" XGA active matrix screen paired with 2MB of high-speed VRAM provides crisp 1024 x 768 resolution and a palette of up to 65,000 dazzling colors.

But don't let its good looks fool you. This system is all muscle. Powered by a 150 MHz Intel Pentium® Processor, the TravelPro 2000 comes equipped with an Opti Viper chipset and 16MB of EDO RAM for lightning-fast performance, plus a more than ample 2.1GB drive and long-lasting lithium ion battery.

The TravelPro 2000 offers such advanced features as 16-bit "real sound" wave table synthesis, built-in video capture, an internal 10x CD ROM, a built-in 33.6 fax/modem, PC Card Type III expansion, fast SIR infrared port— all backed by a three-year parts and labor warranty.

Yes, the new TravelPro 2000 is fit for a king, but priced so that even we "commoners" can afford one. So go ahead. Get a TravelPro 2000 and live like a king. On the road or wherever your business takes you.

For more information about the TravelPro 2000 visit the AMS Tech website at <http://www.amstech.com> or try our faxback service at 1-800-886-2671.

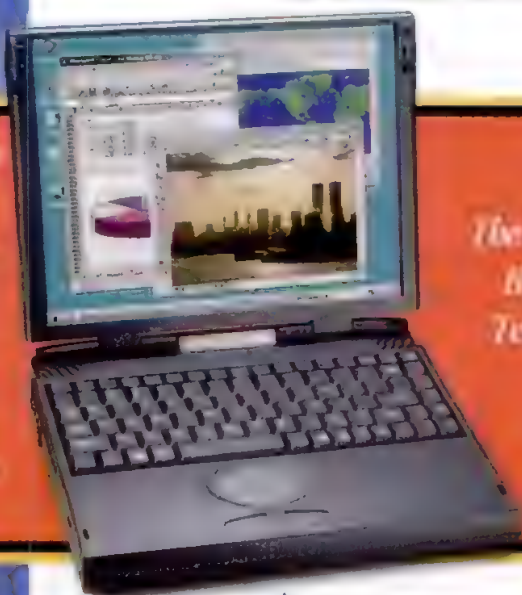
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SEE US AT COMDEX FALL BOOTH #L582A



- 13.3" XGA Active Matrix Display
- 150 MHz Intel Pentium Processor
- 16MB EDO RAM
- 2.1GB Hard Drive
- 33.6 Fax/Modem
- 10x CD-ROM
- 16-bit "Real Sound" Wave Table Synthesis
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Trends Networking

WEB SERVER LOAD BALANCERS

Balancing Act

One of the biggest challenges for anyone managing a large Web site is accommodating the ever-increasing numbers of users. Several new products for balancing Web server loads aim to distribute network traffic across multiple servers, thus guaranteeing uninterrupted access for all of the site's visitors.

Traditional load-balancing methods, such as round-robin DNS, attempt to distribute incoming traffic in a linear fashion, so that an incoming user is directed to the next Web server regardless of that server's existing load. That sometimes allows one server to become overloaded while others remain almost idle.

In contrast, the latest wave of Web server load-balancing products have enough intelligence to gauge which server is best equipped to handle the load.



The first of these packages—Cisco Systems' \$32,000 **LocalDirector** (800-462-4726, www.cisco.com)—appeared earlier this year. This hardware-and-software bundle distributes the load based on server response time and is designed to work with sites that field up to 24 million hits per day.

Following in Cisco's footsteps is the innovative software solution, **HydraWEB**, from HydraWEB Technologies (212-809-5900, www.hydraweb.com). (License prices range from \$4,995 for two servers to \$30,000 for an unlimited number of servers.) HydraWEB balances HTTP requests across multiple servers or logical-content clusters based on server data polling. The package can handle over

two million Web hits per hour.

In addition to its load-balancing capabilities, HydraWEB offers monitoring and management functionality. In the event of a problem, HydraWEB automatically triggers alerts, which can be sent via e-mail, fax, and pager. Each HydraWEB server can be managed remotely using token-based authentication.

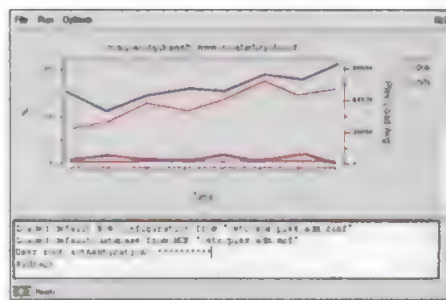
Rad Network Devices (888-

routing device for distributing users among multiple duplicated Internet servers. (\$6,011 with two Ethernet ports; \$7,139 with four Ethernet ports). Highlighted by a continuous Web server polling feature, this product is targeted at ISPs and large corporations requiring 100 percent up-time for Internet access and intranet applications.

F5 Labs (888-882-4447, www.f5.com) has introduced **BIG/ip**,

another hardware-and-software load-balancing solution. (Prices start at \$15,000, plus \$2,500 per server; \$25,000 for a site license.) With a proprietary load-balancing algorithm, BIG/ip provides fault tolerance along with 45-Mbps throughput.

All these products cluster the servers so that the servers appear externally as a single IP address.—Michelle Schoenung



EQUILIBRIUM: HydraWEB Technologies' HydraWEB (above) and Rad Network Devices' Web Server Director (upper left).

234-5763, www.rndinc.com) bills its hardware/software **Web Server Director** as a wire speed IP

servers so that the servers appear externally as a single IP address.—Michelle Schoenung

WINDOWS NT FIREWALLS

Behind the Line of Fire

Despite some controversy surrounding Microsoft Windows NT Server's strength as an Internet security platform, there is an overwhelming demand for Windows NT-based firewalls. At least a dozen software developers have plans to introduce Windows NT versions of their traditionally Unix-based firewall products.

Among the first companies with new Windows NT firewalls is NetGuard (972-738-6900, www.netguard.com). Its stateful inspection **Guardian 2.0** firewall software for Windows NT includes real-time session-monitoring and

bandwidth-control functions (\$3,980 for a 50-user version; \$6,980 for unlimited users). Network administrators can view the

to 200 users.) This packet-filtering application gateway is based on an application-proxy architecture and offers user authentication, Web filtering and caching, IP network address translation, and port mapping. The firewall protects against Java applet-based attacks.



WINDOWS NT-BASED PROTECTION: Seattle Software Labs' WatchGuard.

activities of each Net-connected host simultaneously and generate customized reports detailing Internet application usage through the use of the integrated data collection and reporting tools.

Global Internet (800-682-5550, www.globalinternet.com) is offering **Centri Firewall 3.1** for Windows NT. (Prices range from \$5,000 for 50 users or fewer to \$10,000 for 50

Also on the horizon is CheckPoint Software Technologies' **Check Point Firewall-1 3.0 for Windows NT** (800-429-4391, www.checkpoint.com). (Pricing was unavailable at press time.) This stateful inspection firewall supports a variety of content-inspection and cleansing applications from such vendors as Cheyenne Software, Integralis,

McAfee, Symantec, and Trend Micro. It also provides integrated antivirus capabilities, encryption and authentication functions, and Java and URL screening. The product will include enterprise management features that keep track of network usage. A load-balancing feature will be offered as a separate option.

For those on a budget, Seattle Software Labs' \$2,995 **WatchGuard** for Windows NT (206-521-8340, www.sealabs.com) is a low-cost, hardware-and-software firewall solution that provides dynamic packet filtering and proxy-server functionality. Seattle Software claims that its WatchGuard is so easy to install and configure that you don't have to be a network administrator to set it up.

The package's early-warning system sends out an alarm if potential security risks are detected. Plus, there's real-time monitoring and the ability to generate reports documenting suspicious activities.—MS

RECAP Firewalls were last reviewed in the Network Edition of our issue of March 12, 1996. An Editors' Choice was awarded to Trusted Information Systems' Gauntlet Internet Firewall.

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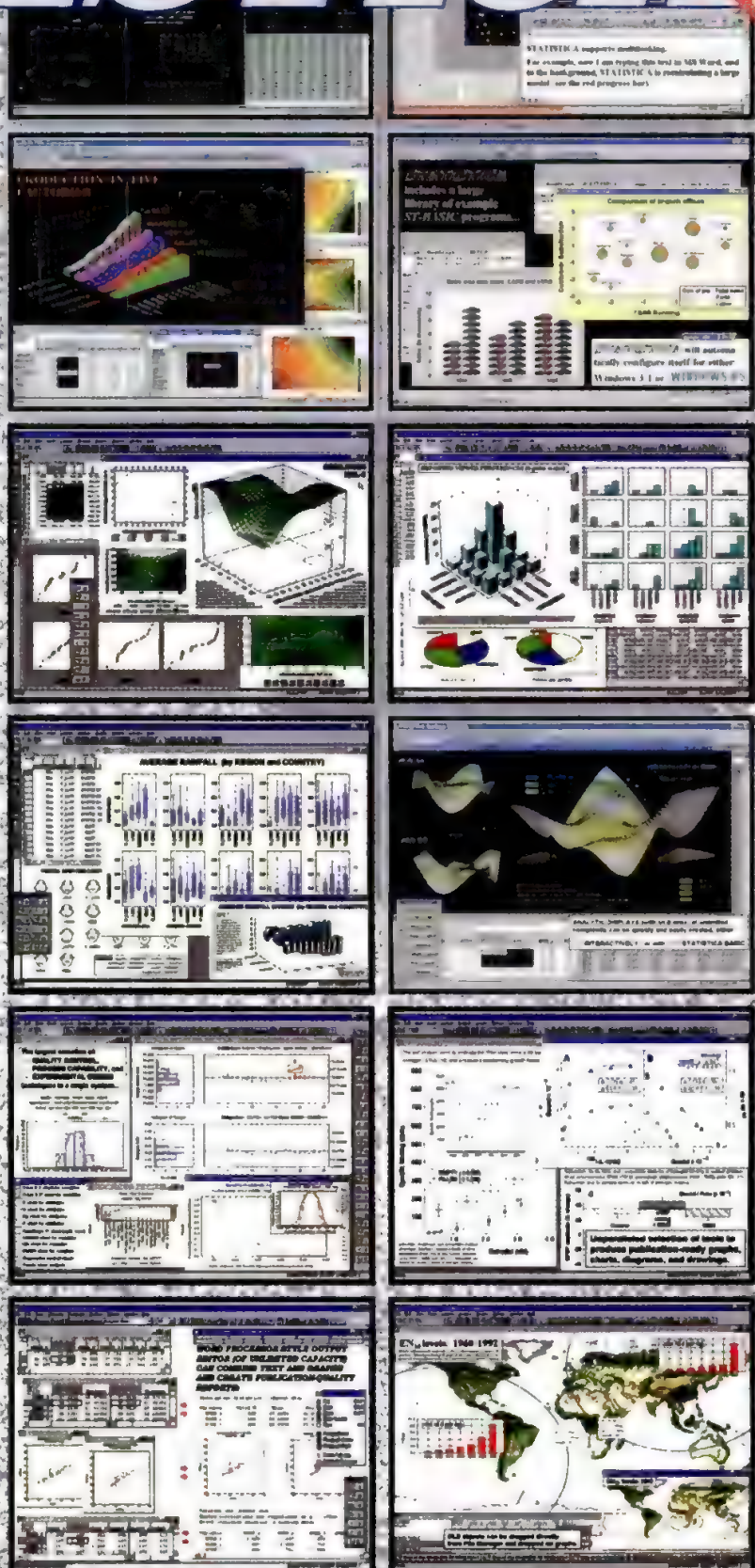


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U.S. Robotics

First Looks

Psst! Keep a Secret?

This quartet of cryptography programs can safeguard your data and communications.—By Jay Munro

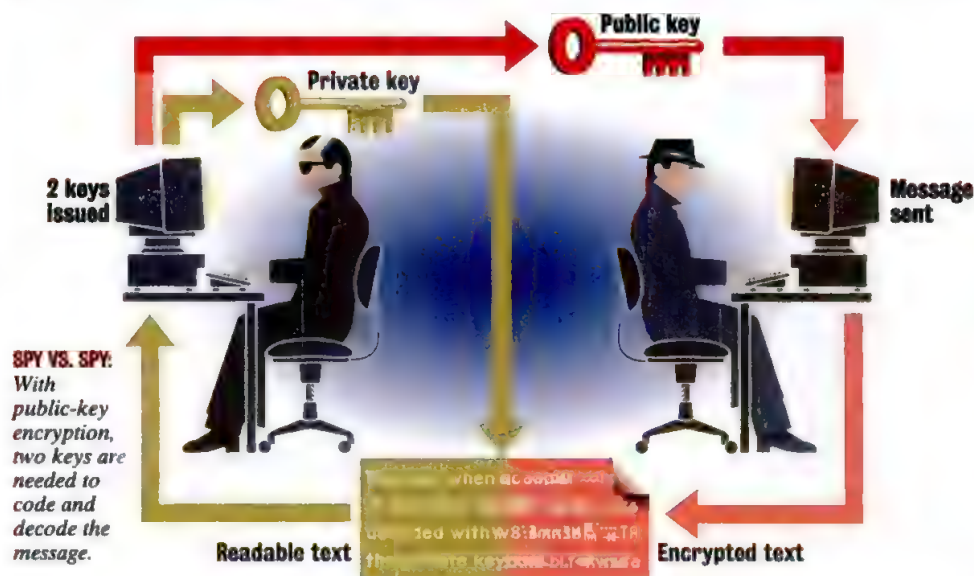
Mention the word cryptography and many people begin to hear the pounding drums of the "Mission Impossible" theme song in their heads. But what happens when you send confidential data via the Internet? And if your laptop were stolen, would someone have access to your e-mail, online accounts, and company secrets? Today we all need to protect our

Business Edition, AT&T's \$180 SecretAgent, and RSA's \$129 SecurPC for Windows 95—use one of two basic technologies: symmetric key or asymmetric key. Single- or symmetric-key systems rely on one password that the reader must have in order to view the coded message. A symmetric-key system works fine when you can personally give the password to the person

private key from the public key.

Under federal law, exporting cryptography products that use keys longer than 40 bits for symmetric algorithms or 512 bits for asymmetric systems without government approval is equivalent to trying to export tanks or missiles. Cryptographers feel that this limitation keeps companies from safeguarding sensitive data. In the coming year, look for the development of a high-level solution that will be strong enough for mission-critical data and still win government approval.

The products reviewed here are all for domestic sale only;



SPY VS. SPY: With public-key encryption, two keys are needed to code and decode the message.

data against prying eyes.

Compared with simple ciphers of the past, modern encryption techniques employ complex mathematical algorithms that scramble data at the bit level. This renders a file as just so many garbled characters until the required password is entered and the program decodes the sequence.

The four programs we evaluated—Symantec's \$90 Norton Your Eyes Only, Pretty Good Privacy's \$149 PGP for Windows,

who will decode the document. If not, you have to rely on a phone call or an e-mail message and hope it remains confidential.

The problem of handing off a secure key is eliminated by asymmetric or public-key encryption, which uses two keys. To send a secure message to someone, you use that person's public key to encrypt the message, and the reader uses a private key to read it (see illustration). Although the two keys are complementary, it's nearly impossible to extract the

each of the four companies makes a parallel product for export. These four programs bear witness to the increased corporate emphasis on security and the range of cryptographic methods available. If you're looking for e-mail security, then consider SecretAgent or PGP. If all you want is a hassle-free way of encrypting files, check out SecurPC. Of the four, only Norton Your Eyes Only can secure all the data on your PC, but it lacks integrated e-mail support.

INSIDE



MAKING MOPIES: The HP LaserJet 5Si Mopier. See Page 60 for a full review.

ANTIVIRUS SOFTWARE:

Just what the doctor ordered to fight those PC virus blues. See Page 52.



DATABURST ISDN: Fast, cheap, and easy access for the SOHO market. Page 66.

More Products Reviewed

CompuServe 3.0.....	54
Three 21-inch monitors	64
Microsoft IntelliMouse	65
Sony DVBK-1000	66
Web Buddy 1.0	70
VisualX for ActiveX 1.0.....	70
e-Check	73
OS/2 graphics	73
Ornamatica	76
ScanAce III.....	76

First Looks Online Go online December 9 to 13 to discuss cryptography with reviewer Jay Munro and vendor representatives.
[**WWW.PCMAG.COM/**](http://WWW.PCMAG.COM/)
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First Looks

Editors' Choice

• Norton Your Eyes Only



Even the most airtight security measures are useless if you don't use

them. That's why in evaluating these cryptographic programs, our priorities were ease of use, features, and performance. Based on these factors, Symantec's \$90 Norton Your Eyes Only is our Editors' Choice for its comprehensive local and enterprise data security, transparent operation, and quick coding and decoding of files.

With its strong Microsoft Windows 95 integration and its ability to encrypt and decrypt files in the background, YEO was the easiest to use of the four programs we reviewed. Most notable was its SmartLock feature. Once you log



The speed with which the programs encrypted and decrypted test files varied greatly. We chose to use the programs' default security settings for performance testing because that's what most people use. Of the four, Norton Your Eyes Only and SecurPC were the speed demons at both encryption and decryption, regardless of file type or size.

If you're looking to keep snoops out of your PC, look no further than this quartet of cryptography programs.

Symantec Corp.

Norton Your Eyes Only



With Symantec's \$90 Norton Your Eyes Only, data security is just a right mouse click away. Among the programs we looked at, Your Eyes Only (YEO) was not only the fastest and easiest to use but the one that provided the most comprehensive local and enterprise data protection.

Like SecurPC, YEO is added to the right click menu in Windows Explorer. To encrypt or decrypt files, you right-click on a file or folder icon and select YEO. Unlike such products as PGP, YEO is designed for personal and enterprise file and disk security rather than e-mail protection.

Once you log on and enter your password at start-up, encryption and decryption are performed in the background without any further prompting for passwords. Most of the time you don't even know YEO is there; the only telltale sign is that opening large files takes a few seconds.

The program's SmartLock folders are automatically decrypted when opened and encrypted when closed. We set up a directory of encrypted .DOC files and accessed them with Microsoft Word without having to decrypt them first. If someone tries to view the files

on at start-up, files in SmartLock folders are automatically encrypted and decrypted as you use them. The process is so transparent you hardly notice it happening.

Other laudable features include BootLock, which bars unauthorized users from rebooting to gain access to your system; ScreenLock, a password-protected screen saver; and a comprehensive audit log. YEO supports a range of security levels up to 2,048-bit key length; at its default key length of 768 bits, it was the fastest of the four programs on encryption tasks and second only to SecurPC on our decryption tests.

The only area in which it falls short is e-mail security, where YEO relies on encrypting attachments. By contrast, SecretAgent is able to work with VIM and MAPI e-mail systems to encode and decode full messages. PGP's specialty is key management, while SecurPC is notable for its Autocrypt feature—which provides on-the-fly encryption and decryption—and its ability to encrypt files with two public keys.

without logging on to YEO, the files stay under lock and key.

YEO offers several kinds of features not found in the other packages reviewed here. BootLock prevents unauthorized users from accessing the sys-

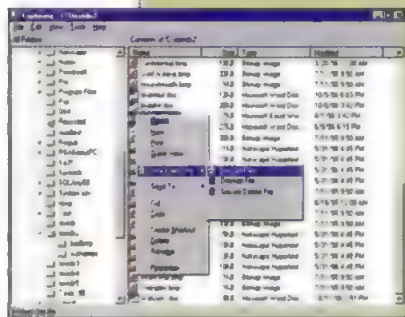
Norton Your Eyes Only

Street price: \$90. Requires:
8MB RAM (16MB recommended),
6MB hard disk space,
Microsoft Windows 95

Symantec Corp., Cupertino, CA
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tem by rebooting from a floppy disk or the hard disk. An emergency UnLock Disk feature

allows users to access their data after a system crash even when Windows 95 won't start.

If you stop using your PC for a set period of time, YEO's ScreenLock activates a screen saver and blocks access to files until the password is reentered. Password control in YEO is comprehensive, with full control over time out, password length, periodic password updates, and saving of previous passwords.

With YEO's audit log, you can track such events as user log-on and log-off; user names that correspond to failed log-on and access attempts; program executions; ScreenLock and Unlock; and any changes to user accounts and file-access settings. A useful addition is the customized reports, with full control over events, time range, sorting, users, and fields.

YEO is easy to install and operate using the default settings, although we ran into a conflict between the screen-saver setting (which turned on after 10 minutes of inactivity) and the PC's power-management setting on our test machine; we quickly resolved the problem, however. Along with SecurPC, YEO sets the pace for encryption speed, running through our test files about five times as fast as its slowest competitors.

For complete, quick, set-it-and-forget-it PC disk and data security, Norton Your Eyes Only is a compelling solution.

Pretty Good Privacy Inc.

PGP for Windows, Business Edition

PGP for Windows, Business Edition is a powerful encryption utility designed primarily for e-mail security, but it can handle local file security as well. Based on Phil Zimmerman's program, Pretty Good Privacy, the \$149 PGP combines extensive security with management features.

PGP puts data encryption, sig-

nature and verification, and key management in one package. The program runs under Windows 95 and Windows NT, but support for long filenames won't be added until early next year.

To use PGP, you first generate private and public keys. Key generation involves selecting a key length between 384 and 2,048 bits. The generated key can be set to remain active or to expire in from 1 to 999 days. Additionally, you can set the key type to encrypt/decrypt only, sign/verify only, or both. For added security, PGP uses case-sensitive pass phrases to create keys; pass phrases can contain any character, including spaces.

The program can set dozens of configuration parameters. For example, you can limit user access to certain actions, such as adding or extracting a key, signing or encrypting, or generating new keys. In addition, PGP's Enclyptor floating toolbar puts encryption, signing, and verification at your fingertips, whether you're working in a word processing or e-mail client. Using the



Enclyptor, PGP works with Clipboard text—the only product of the four we looked at that could.

When you encrypt or decrypt material, the results are written to a temporary file and displayed in a viewer. Notepad is the default editor, but you can specify any Windows text editor.

And you can augment security by automatically compressing files before encryption. When PGP encrypts a file, it creates a new file with an .ASC extension; the user can set the program to delete the original.

After you encrypt a file with a public key, you can no longer access it unless you have the matching private key. To get around this problem, PGP lets you encrypt the file with two public keys, so you can keep a working copy of the file for yourself.

PGP lacks support for long filenames, and it was the only product we looked at that requires the user to okay each file when working with multiple files, a process we found tedious.

Though PGP's primary function is the easy application of public-key cryptography, it also supports IDEA symmetric-key encryption. When you select IDEA encryption, you're prompted for another pass phrase to encrypt the file. A

unique security feature is the program's For Your Eyes Only setting, which limits the display of documents to one page at a time.

PGP was the slowest or next-to-slowest program on all our tests. But the program provides a full range of security options in a convenient, easy-to-use package, and it's an excellent choice for the security-minded.

AT&T Business
Communications Services

SecretAgent

At \$180, SecretAgent is the highest priced of the programs in this roundup. But it's well worth the price, because you get an industrial-strength, mail-enabled, encryption program that provides a wide variety of approaches to PC security.

In SecretAgent's main dialog box, you select the files you want to encrypt from a directory and file list. Files can be selected from multiple directories, but once encrypted they are saved to a single directory. SecretAgent offers four standard encryption protocols, any of which should be sufficient for most work; the company's Web site provides a list of options.

For key generation, SecretAgent allows you to set a user ID and password of up to 40 characters each. Keys are stored in proprietary .PKF files, which can be merged, edited, or deleted using the program's Key Manager.

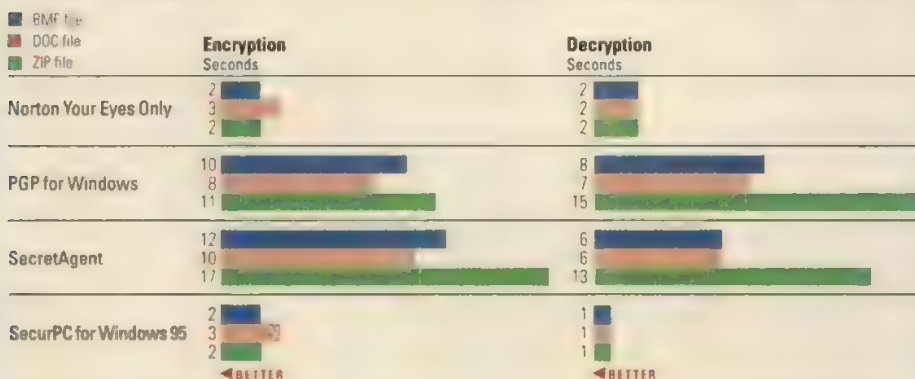
You can select either 512- or 1,024-bit keys. The program's RSA-based public-key implementation is a two-step process. The message is encrypted with a random DES (data encryption standard) key and then encoded with the RSA public key. On the receiving end, the recipient first decodes the RSA with a private key; the recovered DES key is then used to decode the actual message.

You can e-mail coded messages automatically via VIM- or MAPI-compliant clients. If you use Microsoft Word for Windows

PERFORMANCE TESTS

Cryptography Software

We timed how long it took to encrypt and decrypt a 788K .BMP file, an 850K .DOC file, and a 729K .ZIP file. Most users opt for the default key lengths. We therefore tested each program using its default setting: 512 bits for SecretAgent, 128 bits for Norton Your Eyes Only and SecurPC for Windows 95, and 1,024 bits for PGP for Windows.





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First Looks

Encryption Software: Side by Side

✓ YES ✗ NO
Products listed in alphabetical order
Red type denotes Editors' Choice.

	Norton Your Eyes Only	PGP for Windows, Business Edition	SecretAgent	SecurPC for Windows 95
Public-key/symmetric-key encryption	✓✓	✓✓	✓✓	✗✓
Customizable key length/Compression before encryption	✓✗	✓✓	✓✓	✗✗
Long-filename support	✓	✗	✗	✓
Encrypts multiple files	✓	✓	✓	✓
Creates self-extracting encrypted files	✗	✗	✓	✓
Imports and exports public keys	✓	✓	✓	✗
Emergency one-time password/access disk	✓✓	✗✗	✗✗	✓✓
Trustee-key splitting	✗	✗	✗	✓
Encrypts/decrypts to clipboard	✗	✓	✗	✗
Direct e-mail support for MAPI and VIM	✗	✗	✓	✗

* Each encrypted file must be verified individually.

** This feature is available in the Administrator version only.

or WordPerfect, you can import macros to enable secure file handling within those programs. SecretAgent runs under Macintosh and Unix as well as Windows 3.x, but there's no native Windows 95 version. SecretAgent can compress source files before encryption both to reduce file size and augment security; options include LZSS and RLE compression software.

SecretAgent provides plenty of context-sensitive online help, and the program's documentation—available online and in book form—includes details on how the program's algorithms work; this level of detail may confuse nontechnical users.

In terms of performance, SecretAgent was at or near the bottom of our list of four programs, but the program's slowness is balanced by its exceptional e-mail security, local-data-protection features, and support for a wide range of encryption standards.

RSA Data Security

SecurPC for Windows 95

In many corporations, the biggest security risk arises because employees don't use the provided encryption software. It's either too hard to understand or too clumsy for everyday use. RSA's \$129 SecurPC for Windows 95 is a no-frills, personal encryption system that works behind the scenes.

SecurPC uses RC4, a symmetric algorithm developed by Rivest with a key size of 128 bits. To keep things simple, SecurPC works from within Windows Explorer and has no user interface of its own.

To encrypt a file with SecurPC, you select a file or directory in Explorer or My Computer, right-click on its icon, and select Encrypt. A dialog box pops up showing the file

user name. The program then asks for a password and encodes the file; a similar process is used to decrypt a coded file.

If you're working with a number of files, rather than having to reenter the password for each file, you can specify the number of minutes for the password to remain active in memory. SecurPC can also decode a group of files with a single-password entry. On the other hand, you can't work directly with e-mail messages.

When you encrypt a file, you have the option of keeping or deleting the original file. If you delete the file, SecurPC wipes out the file area on your hard disk and automatically eradicates all traces of the file; this means you cannot undelete the file. The program labels all encrypted files with a .!!! extension. SecurPC does not encrypt already encrypted files, program files, system files in the Windows directory, or its own program files.

Among the four programs we looked at, SecurPC is unique in its ability to create self-extracting encrypted files for distribution to those who don't have the program on their PCs. Once the recipient enters the password, the file automatically opens itself.

The program's Autocrypt

feature lets you specify files or directories to be decrypted automatically when Windows starts and encrypted automatically when you select a special SecurPC shutdown mode from the Start menu. Although the Autocrypt feature worked flawlessly for us, we had to use a separate shutdown procedure and a special password to activate it upon exiting Windows. And if you hit Cancel while exiting, the files are not encrypted.

For the corporate-minded, SecurPC allows an administrator or security officer to access user files in an emergency, provided the program's Emergency Access feature has been activated. During installation, you simply specify whether access requires a single password, or two or more. In the case of split passwords, you can specify the number of trustees—from 3 to 255—needed to decrypt a file.

In terms of speed, SecurPC was in a dead heat with Norton Your Eyes Only in encryption, but it took the lead when decrypting our test files. SecurPC places speed and ease of use above all other criteria, making it a good, low-maintenance choice.

SecretAgent

List price: \$180. Requires: 1MB RAM, 1MB hard disk space, Microsoft Windows 3.x

AT&T Business Communications Services
Greensboro, NC
800-203-5563, 847-405-0390

www.att.com/bcs/secure_software

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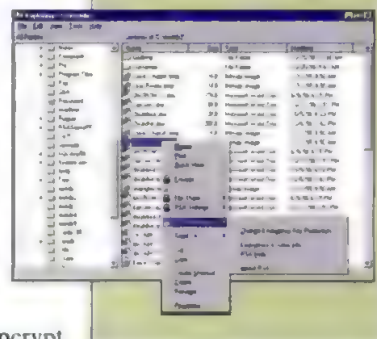
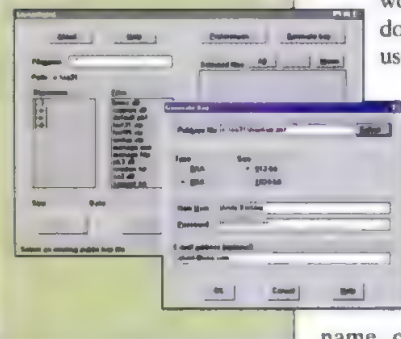
SecurPC for Windows 95

List price: \$129. Requires: 8MB RAM, 1MB hard disk space, Microsoft Windows 3.x, or Windows 95

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First Looks

ANTIVIRUS SOFTWARE

Tale of Two AV Scanners

Both these programs root out the latest viruses, but each has its own strengths.—By Barry Simon

It's a cruel world out there, and when it comes to computer viruses, it's becoming crueler every day. When we last looked at Microsoft Windows 95 antivirus scanners ("Antivirus Utilities," May 14, 1996), traditional viruses, which do their dirty work by corrupting and destroying executable files or the disk's boot sector, still held sway. These viruses have now been joined by a more insidious class of PC pathogens that can sneak into your system under the guise of a macro language or arrive in encrypted form. And in today's connected world, these destructive pests are spreading faster than ever.

Given this environment, the major new releases from two leading antivirus vendors are a welcome relief. We put McAfee's \$45 Virus Scan 2.0 for Windows 95 up against Symantec Corp.'s \$70 Norton AntiVirus 2.0 for Windows 95, an upgrade of the program that won an Editors' Choice in our May 14, 1996, roundup.

These two programs have

a lot in common. Both have been certified by the National Computer Security Association (NCSA) for their ability to detect every virus on the organization's WildList—viruses that have been reported by computer users—and at least 90 percent of the NCSA's zoo of over 6,000 laboratory viral strains.

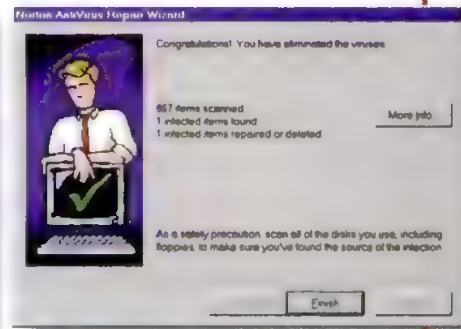
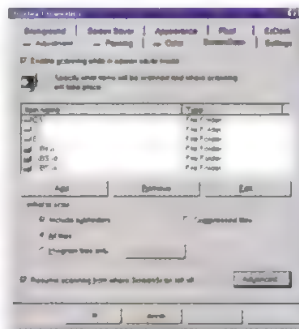
At the click of a mouse, both programs can periodically update the virus definition files used to distinguish harmless files from those that can mess up a PC. McAfee and Symantec post updated virus definition files on bulletin boards and corporate Web sites at the beginning of each month—more often in emergencies. Both are free, but using VirusScan's update feature can be confusing because the program combines the update with an option to purchase additional customer support.

Beyond the basics, these pro-

grams go their separate ways. For example, Norton AntiVirus excels at identifying pesky polymorphic viruses, which use randomly encrypted code to thwart traditional antivirus scanners. Norton AntiVirus does this by creating a protected virtual PC within the CPU to keep any captured polymorphic viruses from escaping and damaging the system. The scanner de-

Scan can be set to scan the system whenever the screen saver is activated.

To evaluate the performance of each program, we measured how long it took them to examine a 2GB hard disk loaded with a wide variety of data, including .DOC, .DOT, and .EXE files. These are the prime targets for infection, and VirusScan scrutinizes them by default. Out of



BEHIND THE SCENES: VirusScan's ScreenScan can scan files in the background whenever your screen saver is activated. It takes only seconds to disinfect files once you've scanned them. Norton AntiVirus's Repair Wizard makes the process a no-brainer.

crypts and examines the first few bytes of executable code, searching for the telltale signs of virus activity.

For its part, VirusScan takes the lead in background scanning when you're not using your computer. If you have a screen saver that uses Windows .SCR files, such as PointCast, Virus-

scan the box, Norton AntiVirus scans these as well as other susceptible files such as .DLLs and Excel documents. To level the playing field, we configured Norton AntiVirus to match VirusScan's default settings. VirusScan completed the hard disk scan in 1 minute 20 seconds, 1 second faster than Norton AntiVirus. But when we added scanning for Excel files and 19 other files that are part of the Norton AntiVirus default setting, VirusScan took 3 minutes 23 seconds to complete the job; Norton AntiVirus took only 3 minutes 14 seconds.

Each program can search for hidden viruses inside compressed .ZIP files. We placed 80 .ZIP files of assorted lengths on the same disk and got dramatically different results from the two programs. Norton AntiVirus zoomed through the files in 4 minutes 21 seconds but we stopped the VirusScan test after 45 minutes, with the job still incomplete. McAfee engineers said that it was likely that the

PERFORMANCE TESTS

Antivirus Programs

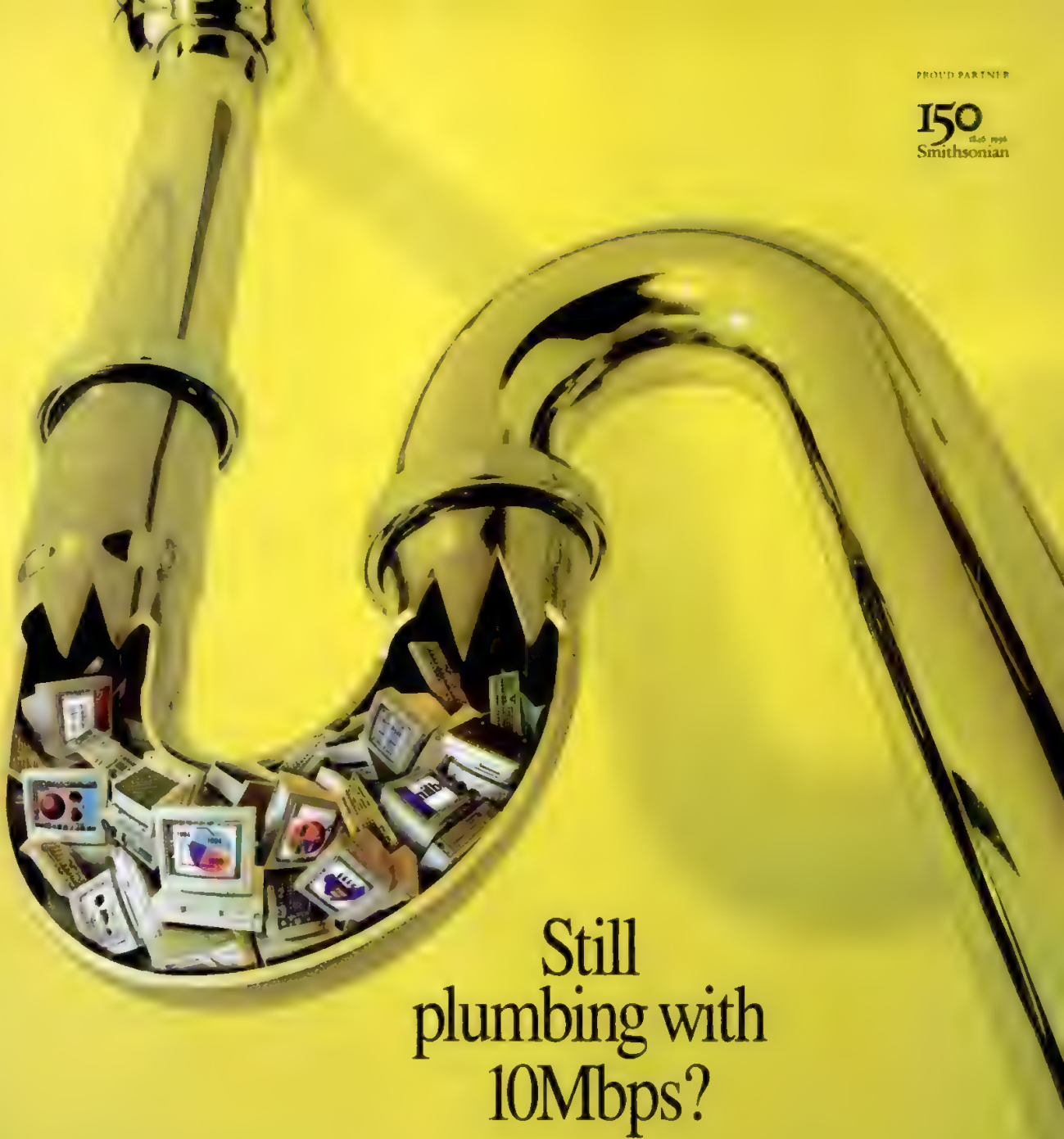
To evaluate the relative performance of Symantec Corp.'s Norton AntiVirus and McAfee's VirusScan, we timed each program scanning a 2GB hard disk for viruses. When the programs scanned only .DOC, .DOT, and .EXE files—the VirusScan defaults—there was little difference in performance. We then configured each program to scan a more comprehensive list of 20 file types: the Norton AntiVirus defaults.

On this test Norton AntiVirus took 3 minutes 14 seconds, and VirusScan took 3 minutes 23 seconds. Finally, we had each program scan the hard disk's .ZIP files. Norton AntiVirus zoomed through the 80 files in 4 minutes 21 seconds, but we stopped VirusScan after 45 minutes, with the job still incomplete.

To test these antivirus programs, we used a Pentium/200 PC running Microsoft Windows 95.

	DOC, .DOT, and .EXE files (VirusScan defaults)	20 file types (Norton AntiVirus defaults)	.ZIP files
	Minutes:seconds	Minutes:seconds	Minutes:seconds
Norton AntiVirus	1:20	3:14	4:21
VirusScan	1:20	3:23	45:00*

* The program was still scanning when we stopped it after 45 minutes.



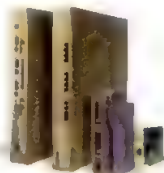
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First Looks

program was scanning every element, rather than singling out program files, and that McAfee's decompression routines weren't yet optimized.

Both programs found and deactivated every virus we threw at them, but the two programs take differing tacks when they find a virus. VirusScan stops to alert you of the infection and asks whether you want to clean it right away or proceed. Norton AntiVirus takes in the big picture: It waits until the disk is fully scanned to tell you what it found and then asks you whether you want to fix it. Once viruses were identified on our Pentium/200 test-bed, disinfection was nearly instantaneous. Both programs wiped out all viruses from our system in a second or two.

Surprisingly, these two very different programs have similar interfaces, but Norton AntiVirus has a slight edge in flexibility. For example, if you need to inspect a subset of your disks, Norton AntiVirus lets you do it with a few simple check boxes. With VirusScan, you have to prepare a text file listing the drives to scan.

Norton AntiVirus also makes the most of wizard technology. The program's Repair Wizard helps out when infection strikes and makes cleaning your disk a lot easier. On the other hand, we found an annoying bug in Norton AntiVirus: The Netscape Navigator Helper applet that collects virus signature downloads from Symantec's Web site sometimes exited before the file could be saved. Since the file is initially placed in the TEMP directory, it was not lost, but loading it manually was a nuisance.

One nice touch in VirusScan is the addition of a Scan item to the right-click context menu for any drive. And network administrators will appreciate the ability to password-protect VirusScan.

These antivirus programs are

well matched and each provides formidable protection for your PC. Some users will prefer Norton AntiVirus's smoother interface and more conservative approach; others will be attracted by VirusScan's background scanning feature. Either way, you'll have strong antivirus medicine.

ONLINE SERVICES

CompuSurf the Web

CompuServe's long-awaited upgrade delivers equal parts content, functionality, and looks.—By J.W. Olsen

CompuServe 3.0 has been a long time coming. But this 32-bit client, with its striking interface and virtually seamless integration with Microsoft Internet Explorer, has been worth the wait. Although this version is an interim step to an all-HTML world for CompuServe, this free upgrade is a no-brainer for current users and may attract new customers as well.

The successor to WinCIM 2.x, CompuServe 3.0 (CS3) requires Microsoft Windows 95, or Windows NT 3.51 or 4.0. CS3 arguably puts CompuServe on a par with America Online ("Adapting to the Web," June 11, 1996). Four areas of enhancement are particularly notable: integration with Internet Explorer; online multitasking; a striking multimedia interface that exploits the World Wide Web; and customization features.

The integration of Internet Explorer 3.0 is so seamless that you may not even realize you're moving between the Web and some CompuServe areas unless you look at the page dialog box in the CS3 toolbar. Enter a Web address and you're using IE 3.0; enter a CompuServe forum name and you're using CS3's proprietary display. No other online service offers such tight integration, although AOL is closing the gap.

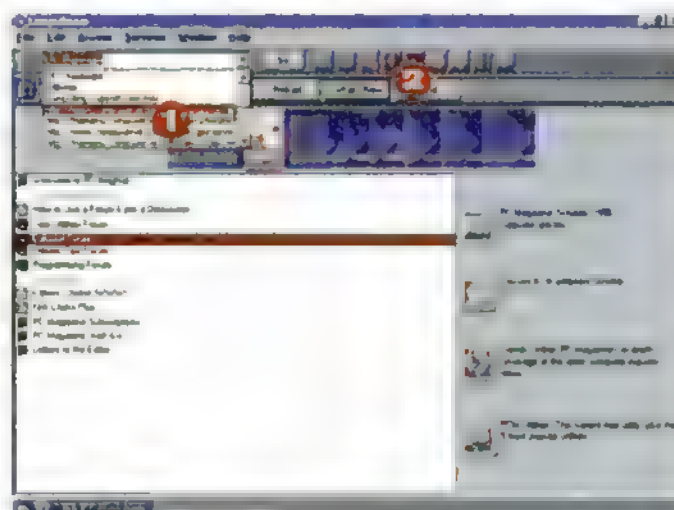
Norton AntiVirus 2.0 for Windows 95. Street price: \$70. Requires: 8MB RAM (16MB recommended), 12MB hard disk space, Microsoft Windows 95. Symantec Corp., Cupertino, CA; 800-441-7234, 541-334-6054; www.symantec.com. *Circle 415 on reader service card.*

VirusScan 2.0 for Windows 95. Street price: \$45. Requires: 8MB RAM, 1MB hard disk space, Microsoft Windows 95. McAfee Associates Inc., Santa Clara, CA; 800-332-9966, 408-988-3832; www.mcafee.com. *Circle 416 on reader service card.*

tomating tasks places CS3 ahead of other services in making maximum use of your online time.

Personalization options include the ability to customize toolbar icons, and a Recent Places list helps you track and retrace your steps both on and off the Web.

E-mail support is pretty much unchanged from WinCIM 2.x, although the interface has been streamlined. Our only significant complaint is that CS3 relies heavily on the mouse at the expense of the keyboard. For example, after reading mail you need to delete messages with a



TWO-IN-ONE: When you access a Web page, CompuServe 3.0's main window doubles as Microsoft Internet Explorer.

1 Enter or select a previously visited CompuServe forum or Web site from the same dialog box.

2 Customize the toolbar with command icons of your choice.

mouse click because the keyboard delete key does not work.

CompuServe still reigns supreme in breadth and depth of content. A powerful and intuitive new search functionality makes finding what you want in

CompuServe's unrivaled content base easier than ever. This content, coupled with CS3's fresh interface and Web integration, once again makes CompuServe a strong challenger to AOL.

CompuServe 3.0. Price: Free. Requires: 8MB RAM (16MB recommended), 30MB hard disk space, 9,600-bps or faster modem, Microsoft Windows 95, or Windows NT 3.51 or later. CompuServe Inc., Columbus, OH; 800-848-8990, 614-457-8650; www.compuserve.com. *Circle 417 on reader service card.*

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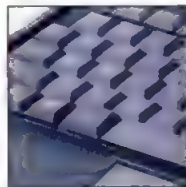
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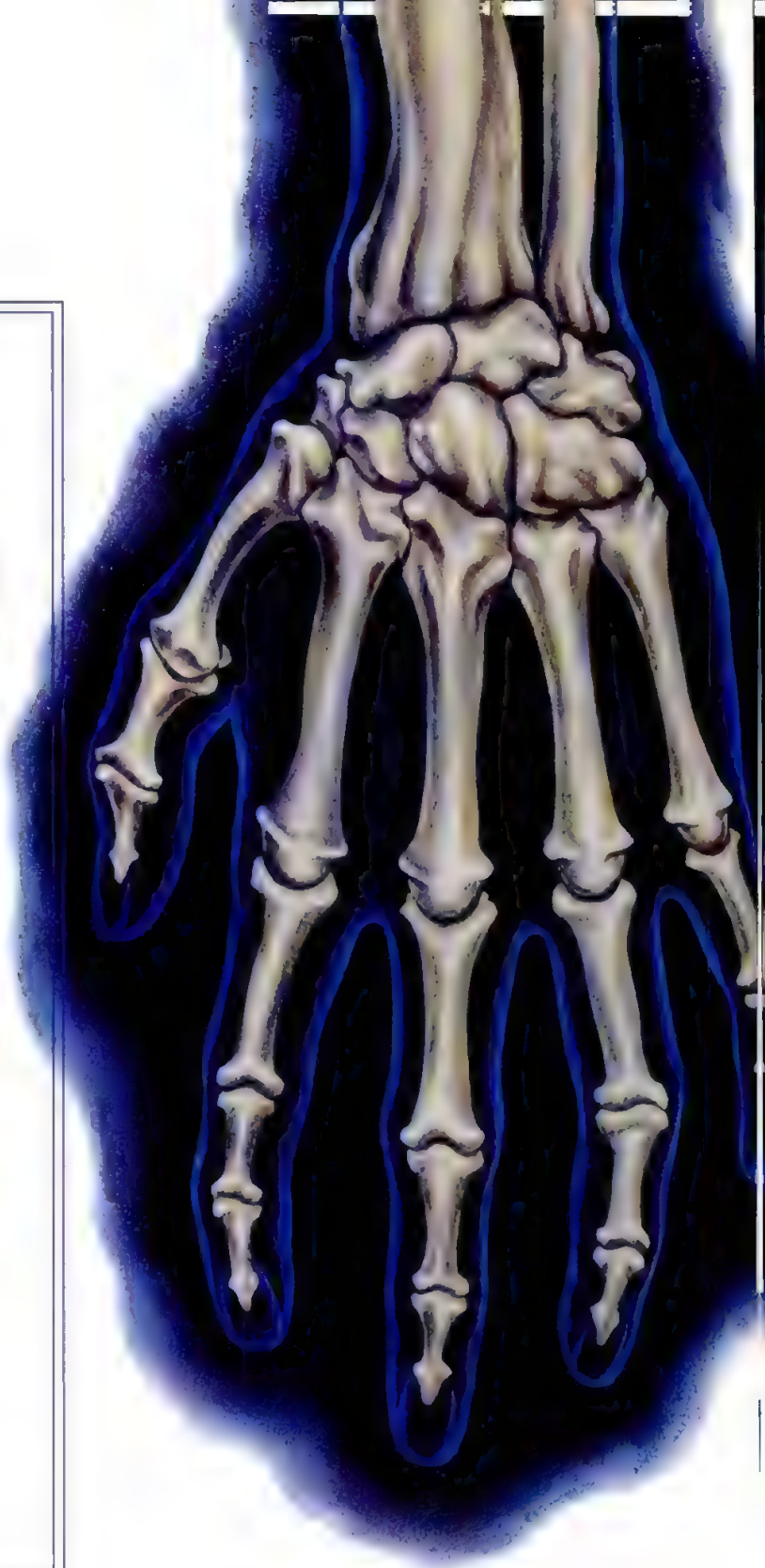
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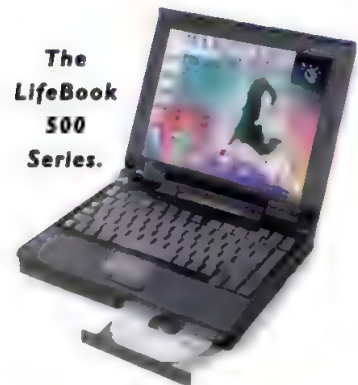
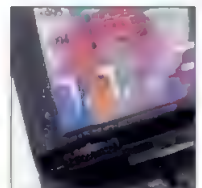
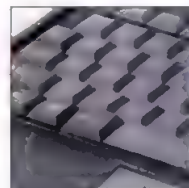
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First Looks

NETWORK PRINTERS

Printer? Copier? It's Both

The innovative HP LaserJet 5Si Mopier saves you from making the trip to the copier.—By Les Freed

Move over, departmental copy machine. The \$9,550 HP LaserJet 5Si Mopier is moving onto your turf. What's a Mopier? Well, a copier makes copies, and a Mopier makes multiple original prints, or mopies in HP parlance. Basically, a Mopier is a LaserJet 5Si with two-sided-printing capability, a built-in hard disk, a 2,000-sheet input tray, and a document sorter and stapler. A new printer driver gives the Mopier the ability to do an array of paper-handling tasks typical of high-end copiers: collating, sorting, and stapling, for example.

PRINTER-COPIER SHUFFLE

We've all done this dance before: You need 10 or 20 copies of a five-page report. You print the original on the laser printer, then walk to your copy machine to make the additional copies. If you're lucky, your copier has a document feeder, collator, and stapler; if you're really lucky, they all work. Of course, the copies never look quite as sharp as your original, especially if your original contains gray-scale images.

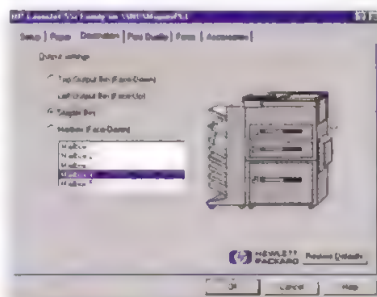
HP has a better idea. When you're ready to print that weekly sales report, you make mopies. The Mopier lets you print multiple copies of a document—doubled-sided, if you like, and neatly collated and stapled—with just a few mouse clicks. The Mopier's 24-ppm print engine and low operating cost make this approach practical.

HP claims a per-page cost that is competitive with—or better than—that of conventional copy machines. The key is economy of scale. The Mopier's enormous toner cartridge is rated for 15,000 pages and costs \$283; that's less than 2 cents a page. Even on high-quality paper, the Mopier's total costs

are less than 4 cents a page. HP claims that a Mopier also requires less maintenance than a conventional copier.

Based on the Editors' Choice-winning LaserJet 5Si MX ("Share and Share a Lot," June 11, 1996), the Mopier is essentially a departmental laser printer with loads of extras. The main printer unit contains 12MB of RAM (upgradable to 64MB), a 420MB internal hard disk, a print duplexer for two-sided printing, Adobe PostScript Level 2 and PCL support, and an HP JetDirect network interface card. A second MIO slot allows you to install an additional JetDirect card, so you can connect two LANs to the Mopier at the same time.

The printer has two 250-sheet paper trays and a manual feed tray that can accept plain paper or envelopes. The printer sits on top of the 2,000-sheet input tray, which does double



duty as a cart. The sorter/stapler installs alongside the printer. All three paper trays accept paper of up to 11 by 17 inches.

The Mopier's seven-bin output sorter provides plenty of paper-handling options. The top tray is a general-purpose output tray; the next tray down is for jobs that need to be stapled and stacked. The five lower trays can be used in three distinct modes. In Mailbox mode, documents are routed to any of the five trays; you can assign each tray to a specific person or department. In Job Separator mode, individual print jobs are sent to successive trays. Finally, in Stacker mode, the printer treats the five trays as one gigantic tray and fills them one tray at a time, starting with the bottom.

PRINT HERE, PRINT THERE

The Mopier's paper-handling abilities allow you to automate the process of creating multipage documents. For example, we produced a sample report in Microsoft Word and filled one tray with blue paper for the first page and a second tray (the 2,000-sheet tray) with white paper for the rest of the document. We selected Stapler Bin as the output destination in the

SMART PRINTING: The HP LaserJet 5Si Mopier's driver provides a wealth of output options for printing, stapling, and collating pages. With a giant 2,000-sheet paper tray and lockable bins, the Mopier looks like a copier but packs network-printer power.

printer dialog box. A minute or so later, our sample report dropped into the output bin, collated and stapled, complete with a blue cover.

The Mopier includes printer drivers for Microsoft Windows 3.x,

Windows 95, Windows NT, OS/2, and Macintosh. The printer driver provides a wealth of paper-handling and printing options. You can select the paper source, one- or two-sided printing, stapling, output destination, and print quality. The print driver can add predefined or custom watermarks to your print job, and it can print thumbnails of up to 16 pages per sheet.

When printing multiple copies of a document, many printer drivers send the print job multiple times. This increases LAN traffic, especially if the print job contains complex graphics or several fonts. The Mopier driver's Transmit Once feature sends the data to the printer once and relies on the Mopier's internal hard disk to store the print job for subsequent copies.

The Mopier's 600-dpi output is excellent, providing razor-sharp text and smooth gray-scale graphics. Not surprisingly, performance was essentially the same as that of the LaserJet 5Si MX, which set the standard for network printing, outperforming even printers with higher-rated engine speeds.

HP also includes their JetPS print server NLM for NetWare servers and JetAdmin printer administration program, which allows you to monitor and configure all the HP LaserJet printers on your LAN from any workstation.

While the Mopier won't replace your copy machine—it cannot make traditional photocopies—it can certainly reduce the copier's workload and foot traffic as well. The Mopier is quieter than a copier, and it uses less electricity. Its copies are high-quality originals, and best of all, it handles all those mundane copier tasks for you. **HP LaserJet 5Si Mopier.** List price: \$9,550. Hewlett-Packard Co., Santa Clara, CA; 800-752-0900; www.hp.com. Circle 414 on reader service card.

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First Looks

LARGE MONITORS

Seeing the Big Picture

Big-screen monitors that support sky-high resolutions are no longer budget-busters.—By Steve Buehler

A year ago, a 21-inch monitor would have set you back more than \$2,500. But as more users see the value of owning more screen real estate, production volumes are increasing and prices are dropping.

A crop of new 21-inch monitors, from NEC, Panasonic, and ViewSonic, show that you can have a larger window on your data for about \$2,000. Though the products' overall features are similar, each manufacturer has developed strengths that set it apart from the others.

The three monitors we evaluated—the NEC MultiSync P1150 (\$2,080), the Panasonic PanaSync Pro P21 (\$1,900), and the ViewSonic P815 (\$1,995)—use 21-inch cathode-ray tubes that produce usable screens measuring between 19.5 and 20 inches. Digital on-screen controls are standard, and all three monitors are MPR-II- and TCO-compliant. Your biggest problem will be finding space on your desk for one of these monster monitors.

Because most monitors of this size share basic features, how a monitor's display characteristics match your specific needs is what's most important. For example, the MultiSync and ViewSonic excel at the linear screen geometry needed for exacting CAD/CAM work. The PanaSync was best at working with tiny detail—screens full of text, for instance—because of its crisp display. Color work showed up best on the MultiSync and PanaSync.

We tested the monitors at ZD Labs, where we measured screen geometry, color range and tracking, luminance, and brightness. We then put the monitors through head-to-head subjective tests, including Sonera's DisplayMate video testing program. To compare color capabilities, we also displayed several Adobe Photoshop images.

When you factor in price, the Panasonic PanaSync Pro P21 is the best overall choice of these

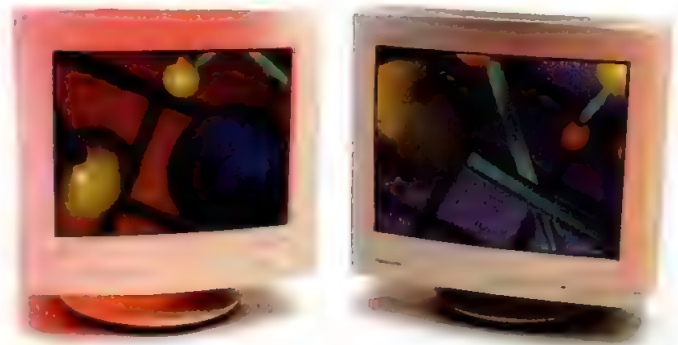
three big-screen monitors. But all three offered solid performance at aggressive prices.

MULTISYNC P1150

While not the largest monitor made by NEC, the MultiSync P1150 may be the best value. At \$2,080, it is considerably

inches of viewable display, the MultiSync showed good color handling; colors were distinctly warmer than with the other two monitors.

Though the MultiSync's tube uses a 0.28-mm dot pitch—the others' used a finer 0.25-mm—the monitor did reasonably well



BIG VALUE: Though its performance results were mixed, NEC's MultiSync P1150 (left) costs much less than NEC's presentation monitors. With its crisp image quality, Panasonic's PanaSync Pro P21 (right) is the choice for everyday business applications.

cheaper than the company's presentation models.

Despite leading this test group on certain performance tests—horizontal pincushioning and luminance uniformity—the MultiSync's picture was marred by the appearance of wavy lines and the presence of thin horizontal lines that trisected the screen. With 19.6

on the MTF (Modulation Transfer Function) test, which measures sharpness. With a maximum screen resolution of 1,600 by 1,200 at a refresh rate of 75 Hz, this monitor wasn't capable of the ultrahigh resolution (1,800 by 1,440) that the other two monitors achieved.

At \$2,080, the MultiSync P1150 is a reasonable value, especially for those who feel more comfortable buying from a company with a reputation like NEC's.

MultiSync P1150. Street price: \$2,080. NEC Technologies Inc., Itasca, IL; 800-632-4636, 508-264-8000; www.nec.com. Circle 411 on reader service card.

PANASYNC PRO P21

Panasonic's PanaSync Pro P21 was an excellent monitor in terms of performance and features. It also uses the least desktop space of this group and weighs in at about 62 pounds. The PanaSync and ViewSonic weigh about the same; the MultiSync was the heavyweight, at almost 77 pounds.

PERFORMANCE TESTS

21-Inch Monitors



Because of its leading MTF score of 65, the Panasonic PanaSync Pro P21 is the best choice for mainstream business users. For CAD/CAM tasks, the ViewSonic P815 was the winner, with strong scores on the Misconvergence, Horizontal Pincushioning, and Vertical Pincushioning tests. Although the NEC MultiSync P1150 excelled on the Horizontal Pincushioning test, its display was marred by wavy lines.

We used the Microvision SuperSpot 200 to measure MTF, misconvergence, and pincushioning and the Minolta Color Analyzer CA-100 to measure luminance, color temperature, color range, color tracking, and uniformity. For subjective testing, we used an HP Vectra 5/90C PC with a Number Nine Imagine 128 video card to view test patterns generated by Sonera's DisplayMate video testing program and high-quality photo images in Adobe Photoshop 3.0.5.

▲ Higher scores represent better performance. ▼ Lower scores represent better performance. Bold type denotes first place.	Average MTF	Miscon- vergence	Horizontal Pincushioning	Vertical Pincushioning	Luminance Foot- lamberts ▲	Color and Luminance Uniformity
	Percent ▲	mm ▼	mm ▼	mm ▼		Score ▼
NEC MultiSync P1150	63	0.12	0.51	0.81	25.9	8.4
Panasonic PanaSync Pro P21	65	0.06	0.99	1.34	29.8	7.9
ViewSonic P815	55	0.06	0.56	0.25	27.9	10.6

▲ Higher scores represent better performance.
▼ Lower scores represent better performance.
Bold type denotes first place.

The PanaSync had the best MTF scores, demonstrating its ability to create sharp lines. It also showed superior crispness on small images, including the tiny closed circles we used on our focus tests. Due partly to the tube's 0.25-mm-dot-pitch screen,

VIEW WITH ROOM: High resolution and low price are not mutually exclusive with the Viewsonic P815.



the clarity of small serif characters was excellent.

The 21-inch tube yields 20 inches of usable viewing space and has very good overall brightness.

Color tests showed the PanaSync to be an accurate but somewhat cool monitor. The on-screen colors were rather flat and subdued, with adequate but not stellar depth. The monitor did have the best color-uniformity, however, which was evident on both performance and subjective tests. Large expanses of one color were uniformly pure, with mottling that can be distracting after you spend extended periods of time in front of the tube. The PanaSync supports screen resolutions of up to 1,800 by 1,440 at 71 Hz.

At only \$1,900, the Panasonic PanaSync Pro P21 should be

your first choice if you're looking to expand the size of the screen on your desktop without having to buy a larger desk.

PanaSync Pro P21. Street price: \$1,900. Panasonic Computer Peripheral Co., Secaucus, NJ; 800-742-8086, 201-392-4812; www.panasonic.com. Circle 412 on reader service card.

VIEWSONIC P815

The ViewSonic P815 did an admirable job on our performance tests and is capable of ultrahigh resolution. Because of its leading scores on most of the misconvergence and pin-cushioning tests, it is our choice for precise CAD/CAM work.

When we moved to color tests, however, the monitor did not perform as well as the others in this group. Colors were slightly mottled over the screen, which quickly became distract-

ing. The color tests showed this monitor to be somewhat cool as well. Images with shadings of red and orange were consistently flat; the colors had little of the impact they exhibited on the PanaSync, for example.

Like the PanaSync, the ViewSonic supports screen resolutions of up to 1,800 by 1,440. But unlike the PanaSync, with its 71-Hz top resolution refresh rate, the ViewSonic tops out at 76 Hz—the best in this group and a clear advantage for demanding users.

At \$1,995, the ViewSonic is a good choice for those who are more concerned with screen geometry, crispness, and price than with color purity and accuracy.

ViewSonic P815. Street price: \$1,995. ViewSonic Corp., Walnut, CA; 800-888-8583; www.viewsonic.com. Circle 413 on reader service card.

PERIPHERALS

Microsoft Does a Wheelie

With a wheel between its buttons, the IntelliMouse goes where no mouse has gone before.—By Edward Mendelson

Microsoft's \$85 IntelliMouse looks like an ordinary mouse except for the rim of a miniature wheel poking through the crevice between the left and right buttons. That seemingly innocuous wheel is in fact the first major innovation in input devices in years.

The wheel is both a scrolling device and, when you press down on it, a third mouse button. When you spin the wheel while using Microsoft's Internet Explorer 3.0 and the forthcoming Microsoft Office 97, you scroll effortlessly through pages without having to move the pointer to a scroll bar.

SPIN, SPIN SPIN

Microsoft plans to assign other convenience features to the wheel-button in Office and other future applications, and an army of third-party developers are using it for a variety of features. Unlike three-button mice from other vendors, the IntelliMouse's wheel-button doesn't

get in the way, and you're unlikely to click it by mistake.

The IntelliMouse 2.0 driver combines features from earlier versions of Microsoft's mouse driver with innovative new functions. A ClickLock feature allows you to drag items without holding down the left mouse button. You can customize this feature by specifying how long you have to hold the button down to activate ClickLock. The wheel can also be set to scroll a specified number of lines or a screen with each click of the wheel.

In most Office 97 applications you can hold down the Ctrl key while turning the wheel to zoom in and out. The wheel and Shift key expand and collapse outlines or drill down or up in spreadsheets and Web pages.

But you can set the driver software so that the wheel-button

ignores all such application-specific actions and instead performs one of four preset functions in all Windows applications. The four choices are: double-left-click, opening an application's help file, switching to Windows Explorer, or bringing up the Start Menu. Other driver features retained from earlier versions include a



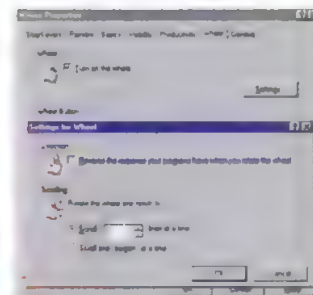
WHEEL OF FORTUNE: The Microsoft IntelliMouse's breakthrough wheel is the best way to scroll through Web pages with Internet Explorer. The IntelliPoint 2.0 mouse driver lets you use the wheel as a third button.

snap-to feature, which moves the pointer to the default button of a dialog box, and a function that adds vapor trails when the pointer moves and makes the pointer disappear when you start typing.

NO FLAT TIRES

On most systems, the driver seemed problem-free, although

on one of our test-beds, it went haywire repeatedly and caused the pointer to select everything it touched. Microsoft's popular low-profile asymmetrical mouse design remains essentially unchanged. The wheel functions in Windows 95 and Windows NT 4.0; other operating systems simply ignore it.



The IntelliMouse retains all the features of the Microsoft mouse and adds the easiest scrolling mechanism ever.

Microsoft IntelliMouse. Street price: \$85. Requires: PS/2 port. Microsoft Corp., Redmond, WA; 800-426-9400; www.microsoft.com/hardware/intellimouse. Circle 410 on reader service card.

First Looks

VIDEO

Video-Capture Firsts

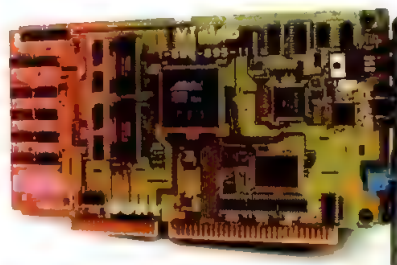
A Sony capture card, the DVBK-1000, breaks new technological ground.—By Jan Ozer

The Sony DVBK-1000 (\$800 street), a still-image capture board, is one of the first peripherals to tap the power of the IEEE 1394 (FireWire) standard. The ISA card is also the first to convert frames from Sony's Digital Handycam recorders to PC format digitally. The DVBK-1000 proved adept at capturing high-quality, low-motion frames from the recorders but stumbled somewhat on higher-motion videos.

The DVBK-1000 has a DV connector for video transport and a Control L (LANC)—protocol connector for controlling the camera during capture. Sony supplies all the required cables and two utilities, Capturer and DV Viewer. Using a preview screen with VCR-like controls, Capturer lets you select and capture frames from the

camera and displays them in postage stamp-size previews. The program can capture up to 100 frames in each album, open multiple albums, and deinterlace frames using a field-based or adoptive algorithm and save them in .BMP format.

Double-clicking on a preview window in Capturer launches DV Viewer, which deinterlaces and displays the frame. DV



CAPTURECAM: The DVBK-1000 can digitally convert frames from Sony's Digital Handycam, and it supports the FireWire standard.

Viewer can also perform minor image editing and store frames in .BMP format.

To test video quality, we compared frames captured with the DVBK-1000 against those captured with Play Inc.'s still-frame digitizer, Snappy. Both devices produced excellent picture quality. In general, for top-quality talking-head stills, opt for the DVBK-1000, which produced superior detail and more accurate color. On the other hand, the Snappy may be a better choice for high-motion sequences, because its antialiasing algorithms

proved more effective at eliminating the jaggies than the DVBK-1000's.

Video developers, take note: The DVBK-1000 does not capture full-motion video, though third-party FireWire cards compatible with the DV-format cards should be



MOTION SICKNESS: The Sony card had difficulty capturing images from high-motion video. Note the pixelation in this sample.

available in early 1997. Those seeking a cheaper option for capturing still images across a range of image types now should consider the \$199 Snappy, which produced slightly inferior detail and color quality in facial shots but outperformed the DVBK-1000 in fast-moving videos.

Sony DVBK-1000. Street price: \$800. Requires: ISA slot. Sony Electronics Inc., Park Ridge, NJ; 800-222-7669; www.sony.com. Circle 405 on reader service card.

ISDN

ISDN for Everyone

U.S. Robotics' DataBurst ISDN 128K offers top-speed ISDN access at a rock-bottom price.—By Edward Mendelson

ISDN has never been easier to use or less expensive to access from your PC. U.S. Robotics' \$279 external adapter, the DataBurst ISDN 128K, plugs into the parallel port between your computer and your printer, and it gives you the same fast performance and ease of use that earned its internal counterpart, the U.S. Robotics Sportster ISDN 128K Editors' Choice status. ("Fast Connections," June 11, 1996). The DataBurst uses U.S. Robotics' TurboPPP feature to combine the two 64-Kbps ISDN lines to emulate 128-Kbps Multilink PPP performance, with faster rates if the remote site uses standard compression techniques.

Like the Sportster, the DataBurst coexists peacefully with any modem; Microsoft Windows treats the unit as a network adapter, not as a modem. Because it connects to the PC through the parallel port, it ignores the 115-Kbps speed limit of standard serial ports—which applies to all other external ISDN adapters. You can use your modem to make analog calls through a COM port while using the DataBurst to make ISDN calls through the parallel port.

Unless you install a second parallel port, the DataBurst shares your parallel port with your printer. By default, the DataBurst driver delays print jobs until

after you unload it, but with almost all printer models you can set the driver to let you print while using the adapter. The adapter slows down during printing, but we hardly noticed the difference. Most printers should work smoothly with the DataBurst.

Unlike the Sportster, the DataBurst has no port for attaching a telephone, fax machine, or external modem. Drivers are supplied only for Windows 3.x and Windows 95, and again unlike the Sportster, the unit won't run



PARALLEL-PORT POWER: The DataBurst ISDN 128K has three status lights: power, line, and network.

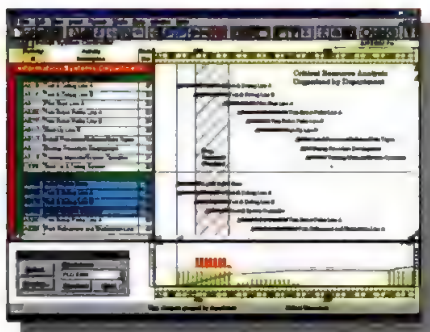
under Windows NT. When you load the driver—normally from the StartUp group—an icon appears on the taskbar, but unlike Windows 95's modem taskbar icon, DataBurst's icon doesn't show you when a call is connected. And if you want to see whether one or both ISDN lines are in use, you have to open a separate status window. Like most current ISDN adapters, the DataBurst has an NT-1 telco connector built in, but a version with no NT-1 is available for \$239.

With its low price, effortless installation, and top-speed performance, the DataBurst is the obvious choice for entry-level ISDN in home offices and small offices.

DataBurst ISDN 128K. List price: \$279. Requires: Microsoft Windows 3.x or Windows 95. U.S. Robotics Inc., Skokie, IL; 800-877-2677, 847-982-5001; www.usr.com. Circle 404 on reader service card.

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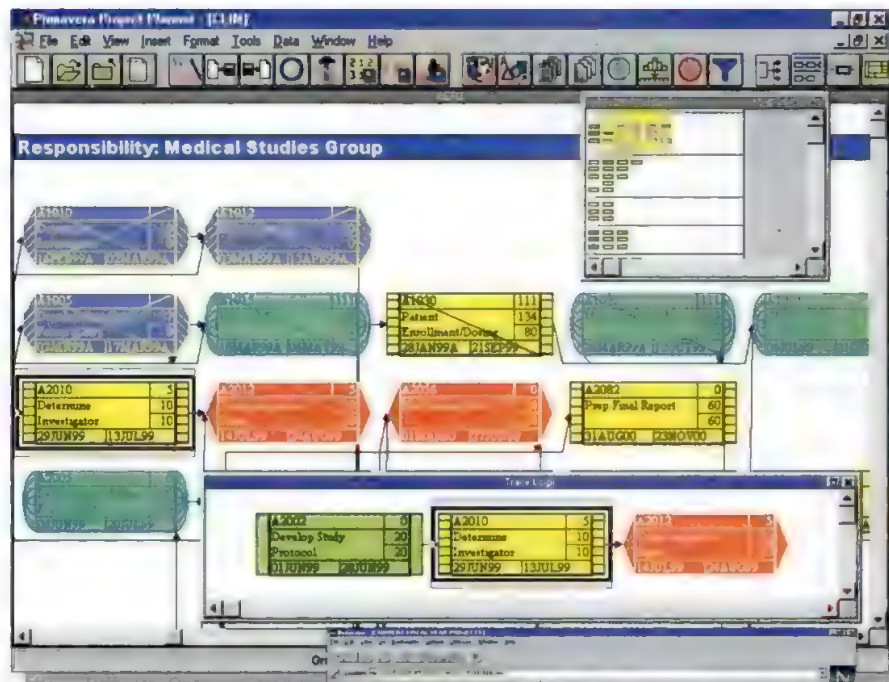


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First Looks

WEB DEVELOPMENT TOOLS

Easier ActiveX Controls

VisualX lets you create reusable ActiveX controls with RAD-tool ease.—By Rich Dragan

Writing reusable ActiveX controls is reputed to be tough, but InterGroup Technologies is out to change that with a powerful, wizard-based design package. The \$395 VisualX for ActiveX 1.0 promises to make it easier for almost any developer to create ActiveX components.

The interface of the VisualX Designer tool will be familiar enough to anyone who has programmed in Visual Basic or other 4GL tools. A wizard gets you started with a working ActiveX template. Projects in VisualX come in .VCX files, and the main project window organizes the layout of an ActiveX control into logical categories, such as properties and events. You design the layout of your component using other ActiveX/OCX controls, placing them on the form and changing their properties and events much as in Visual Basic.

Most of the design work in VisualX involves writing script code for components with VBasic scripting language. It's very similar to Visual Basic but includes ActiveX extensions. Surprisingly, VBasic stays away from Internet support. Instead, you can assemble Internet-based ActiveX components, or call Internet Windows functions directly from within VBasic.

One notable feature of VisualX is the Property Page Designer. This tool lets you design those property pages for use in other applications that will embed your OCX. You can easily add any of the Windows common controls here in order to create sophisticated interfaces, as well as derive new property pages based on old ones.

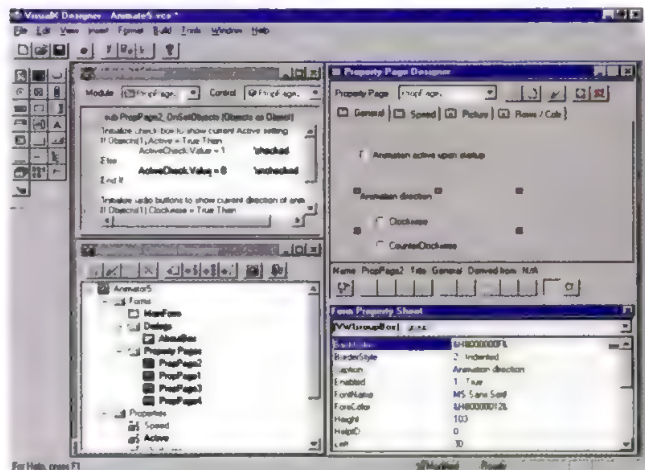
In order to build an ActiveX control, you first compile it from within VisualX Designer.

A successful build generates an OCX control, which is automatically registered in the system so it can be used in any ActiveX-enabled application. Though it was not enabled in the beta version we tested, the shipping product should feature a debugger (now part of InterGroup's VisualWare forms design product).

Future versions will include support for JavaScript. In the meantime, VisualX makes ActiveX control development a lot

easier. Other tool vendors are sure to catch up as ActiveX becomes more widely accepted, but VisualX is here now with a capable package that belongs in every developer's toolbox.

VisualX for ActiveX 1.0. List price: \$395. Requires: 8MB RAM, 12MB hard disk space, Microsoft Windows 95 or Windows NT 4.0. InterGroup Technologies Inc., Bellevue, WA; 800-643-8089, 206-643-8089; www.adhost.com/intergrouptech. Circle 409 on reader service card.



ACTIVE ASSISTANT: VisualX's wizards and visual design tools demystify the process of creating reusable ActiveX components.

WEB UTILITIES

A Browsing Companion

Web Buddy offers some compelling features not found in other off-line browsers.—By Barry Simon

The so-called World Wide Wait has spurred the creation of a new category of utilities for downloading and viewing pages off-line. One of the more unusual entries in this category is DataViz's \$50 Web Buddy 1.0, which allows you to decide exactly how much information to download. Unfortunately, Web Buddy also suffers from the "Version 1" woes.

Web Buddy's big advantage is its flexibility. You can configure it to save a single page or an entire site to disk and tell it how many levels deep to go when following links. Before saving

the pages, the program adjusts the links to any other pages it has downloaded, with pointers to the local files so you can browse the entire site off-line.

Downloaded sites are stored as directories, making it easy to

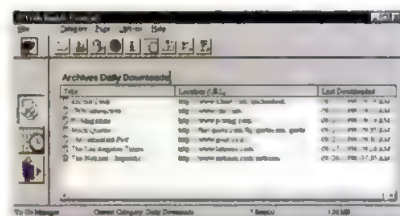
transfer them between machines. By contrast, some of the most popular products in this category store pages only under arbitrary names or in specific locations. For example, FreeLoader stores pages in its own disk cache, and Traveling Software's WebEx assigns nondescriptive names to pages and stores them in its own directory. You can schedule unattended downloads on a one-time or periodic basis, and you can convert HTML pages to one of several popular word processing formats.

Web Buddy's user interface is straightforward and lets you organize sites and bookmarks into categories. We quickly got tired of the interface's barking dog metaphor, however.

A bug in the program prevents the toolbar from working properly with Internet Explorer if the toolbar is launched automatically by the Web Buddy scheduler. There were also a few cases in which some links on saved pages that should have pointed toward the Web pointed toward nonexistent local files instead. And we had several problems with the word processing conversion process.

For a full discussion of five off-line browsers, see First Looks, August 1996. Despite its growing pains, Web Buddy is a promising product in a crowded field.

Web Buddy 1.0. Street price: \$50. Requires: 4MB RAM, 10MB hard disk space, Microsoft Windows 95. DataViz, Trumbull, CT; 800-733-0030, 203-268-0030; www.dataviz.com. Circle 408 on reader service card.



HAND DELIVERY: Web Buddy organizes scheduled downloads into categories and saves them as directories.

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First Looks

ACCOUNTING SOFTWARE

Peachtree Pays the Bills

The e-Check add-on brings electronic bill paying to Peachtree Accounting.—By Kathy Yakal

Peachtree Accounting's e-Check add-on for Peachtree Accounting for Windows 3.5 or Peachtree Complete takes the lead by being the first small-business software package to give you the ability to pay bills electronically.

The e-Check Starter Kit costs \$39. Electronic payment processing for the first 30 days is free. Thereafter you pay \$39.95 per month for the first 25 payments; additional payments cost \$1 each. Back-end financial processing is provided by ECPartners, a joint venture between Peachtree's parent company—ADP—and CheckFree Corp. You can use any U.S. checking account.

Before you can begin, you need to establish an account with e-Check. Your Peachtree files require just a little work as well. When you test modem transmission, your e-Check account is automatically added to Peachtree and linked to the program's general ledger. You have to activate each vendor for e-Check payments.

Every time you pay a bill thereafter, clicking the e-Check box on the check form queues that payment for e-Check processing. Several reports keep you apprised of your e-Check status, including payment status, history, and pending payments. Our setup and payment transmission went smoothly, and payments we'd authorized were processed and sent by e-Check within a day.

Unless the extra cost is prohibitive (and the extra dollar for each check beyond 25 may well be), it's hard to think of a reason why a business already using Peachtree wouldn't want to take advantage of this service.

e-Check. List price: \$39. Requires: 4MB RAM (8MB recommended), 11MB hard disk

space, Microsoft Windows 3.1x or Windows 95. Peachtree Software Inc., Norcross, GA; 800-228-0068, 770-564-5700; www.peachtree.com. **Circle 401** on reader service card.

OS/2 SOFTWARE

OS/2 Graphics Options

Impos/2 and Photo>Graphics take different approaches to OS/2 graphics editing.—By Esther Schindler

Compart's \$200 Impos/2 and TrueSpectra's \$100 Photo>Graphics both help you manipulate bitmap images. Though its interface takes some getting used to, Impos/2, Version 2.01 boasts a comprehensive features set. By contrast, Photo>Graphics, Version 1.02 excels at certain tasks but lacks some basic tools.

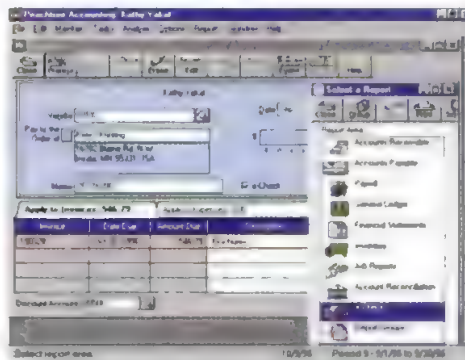
Both programs support OS/2-specific features such as drag and drop, and both exhibit excellent performance and use OS/2's multithreading capabilities. They supply all the expected graphics formats and image filters.

The \$200 Impos/2 provides

TOOL TIME: Impos/2's Tool Settings let you precisely control the behavior of graphic selections.



COLLAGE CREATOR: Photo>Graphics uses layered regions, making it useful for merging different graphics.



CHECKING IN: Once you're set up, paying bills electronically isn't much different from using regular checks. Just click the e-Check box to queue bills for electronic payment.

tools to create and modify images. Instead of working in a single application container window, tools and images float on your desktop. Tools and effects can be applied to the entire image, a mask, or selected areas.

Impos/2 provides four selection tools, including an automatic magic wand. You can adjust the attributes of tools and effects in a setting notebook, including the amount of paint the paintbrush loses as you draw a line and the hardness of the pencil. Almost any behavior can be customized.

Impos/2 has more built-in features and controls than Photo>Graphics: a clone tool, whirlpool filters, and sponges. And you can add favorite tools to the tool window. Impos/2 doesn't just modify images, however; it can capture screen shots. We had mixed results with its scanner driver.

Impos/2 is more difficult to learn than Photo>Graphics. With some experience, though, Impos/2 begins to feel like a favorite pocketknife: It might not be the most powerful tool, but it's the one you reach for first.

Photo>Graphics, Version 1.02 is not a complete graphics toolkit, but what it does, it does well. Instead of painting directly on a picture, you create graphic projects in layers. Each layer consists of interacting resolution-indepen-

dent regions (shapes) and tools (bitmaps, fills, or effects) and can contain effects such as contrast, sharpness, or pixelization.

Some actions, which are difficult to execute in other graphics applications, are easy in Photo>Graphics; creating text with a bitmap background, for instance, takes just a few seconds. Other basic operations, however, are arduous: Creating a blue circle with a one-point red border requires several manual steps, and 3-D effects require a lot of fiddling.

The interface can be awkward to use: Photo>Graphics has no Undo, and during the course of a project, it's inconvenient to switch from edit mode to create mode, and the right mouse button doesn't always work the way OS/2 users might expect.

The bottom line for graphics-oriented OS/2 users: Impos/2 is a jack-of-all-trades, while Photo>Graphics gives you more control over your creations.

Impos/2, Version 2.01. Street price: \$200. Requires: 8MB RAM, 4MB hard disk space, OS/2 Warp, Version 3.0 or later. Compart, Distributed by Indelible Blue Inc., Raleigh, NC; 800-776-8284, 919-878-9700; www.indelible-blue.com/ib. **Circle 402** on reader service card.

Photo>Graphics, Version 1.02. Street price: \$100. Requires: 8MB RAM (16MB recommended), 40MB hard disk space, OS/2, Version 2.0 or later. TrueSpectra Inc., Toronto, Ontario, Canada; 416-224-0076; www.truespectra.com. **Circle 403** on reader service card.

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First Looks

SCANNERS

Scan like an Ace

The ScanAce III is more than an affordable color flatbed scanner. —By Daniel Grotta and Sally Wiener Grotta

The \$900 ScanAce III is an inexpensive but feature-packed color flatbed scanner, designed for those who require better color, extra detail, and more control over their scans. Under the hood is a 36-bit color trilinear CCD that has an optical resolution of 600 by 1,200 dots per inch (dpi) and can produce software-interpolated resolutions of up to 9,600 dpi. Setting up the ScanAce isn't quite plug and play, but it is relatively easy. You'll probably want to pass on the bundled proprietary 8-bit SCSI board for a more robust host adapter.

CyberView, ScanAce's Twain interface, offers extensive tools, such as RGB-to-CMY conversion, a gamma correction window with attached histogram, eight halftone patterns, and manual and automatic brightness controls, among others. You can enter values as numbers or set them via slider controls.

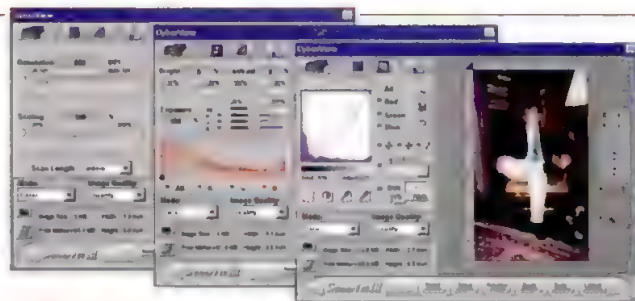
The ScanAce has a 1MB hardware buffer. The unit scans relatively quickly if the image is small enough to remain entirely in memory, although we were surprised by the scanner's noisy operation. One helpful feature is CyberView's ability to perform multiple scans without having to use the Acquire command between scans.

CyberView features excellent zoom and crop functions, but it lacks a sharpen tool and a rotate function. With an optional \$379 transparency head, it's possible to scan transparencies and negatives; Pacific Image Electronics includes 35-mm, 120-mm, 2- by 3-inch, 4- by 5-inch, and 8- by 10-inch film masks. The software includes LUTs (look-up tables)

for Agfa, Fuji, and Kodak negative and transparency film, but there are no profiles for specific film types.

Image quality, whether for continuous-tone or halftone scanning, was consistently excellent. The ScanAce produced smooth gradients, accurate colors, and virtually no aliasing or artifacts. We liked the quality of the raw scans, and the ones we made using automatic corrections were even better.

The manufacturer boasts of a dynamic range of 3.3—meaning that the unit approaches or even



POWER PALETTE: The CyberView interface offers a full complement of high-end graphic-arts tools.

equals much more expensive, professional-quality devices in capturing highlights and shadows. Our tests showed a very respectable dynamic range between 3.07 and 3.15.

The unit is short on included software: It comes only with GO!, ImagePals2, and Xerox's TextBridge. An affordable flatbed color scanner, the ScanAce

III is so easy to use that novices can produce high-quality scans with minimum effort. But it also has the power and features to let experts achieve professional results.

ScanAce III. Street price: \$900. Requires: 8MB RAM (16MB recommended), 20MB hard disk space, Microsoft Windows 3.0 or later. Pacific Image Electronics, Torrance, CA; 800-909-9996, 310-214-5281; www.scanace.com. Circle 406 on reader service card.

GRAPHICS

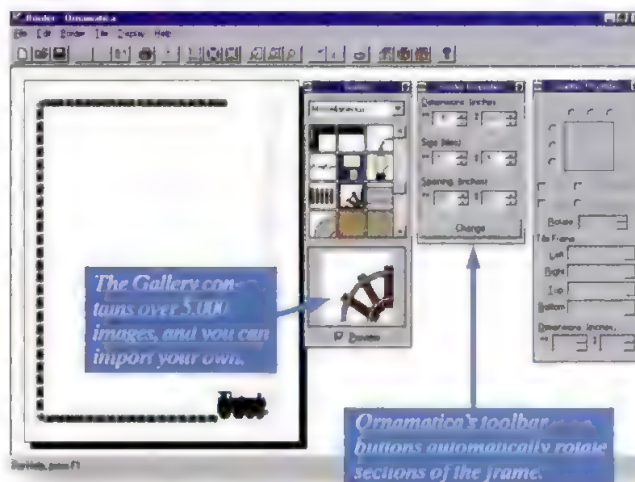
Frame-by-Frame Design

Ornamatica makes it easy to design custom graphics frames for spicing up your documents. —By John Morris

JASC's \$30 Ornamatica simplifies adding decorative frames to bitmapped images so you can easily produce sophisticated-looking borders for such projects as newsletters, invitations, certificates, and signs.

To build a frame, you simply drag and drop graphics onto the tile placeholders. When you're finished, you can save the frame in Ornamatica's border format (.BDR) or export it as a Windows Metafile (.WMF).

FRAMES WITH FLAIR: Ornamatica lets you build frames by simply dragging and dropping graphics onto the tile placeholders.



You can select graphics from the Gallery's collection of more than 5,000 images, or you can import CorelDraw (.CDR) or .WMF files and use them to create frames. Once you add graphics to the tiles, you can resize them, or flip, mirror, or rotate them in 1-degree increments.

Although we were generally pleased with Ornamatica, the designs must be symmetrical (tiles on opposite sides of the frame must be the same size) limiting the design options. And when you resize a tile, the program changes the size of the entire border; there's no option to reduce the number of tiles or shrink them automatically instead. The program has no easy way for adding text to frames to create a scrolling message. Despite these limitations, Ornamatica is a powerful program that can really add some impact to your documents.

Ornamatica. Street price: \$30. Requires: 8MB RAM (16MB recommended), 8MB hard disk space, Microsoft Windows 3.1 or Windows 95. JASC Inc., Minnetonka, MN; 800-622-2793, 612-930-9800; www.jasc.com. Circle 407 on reader service card.



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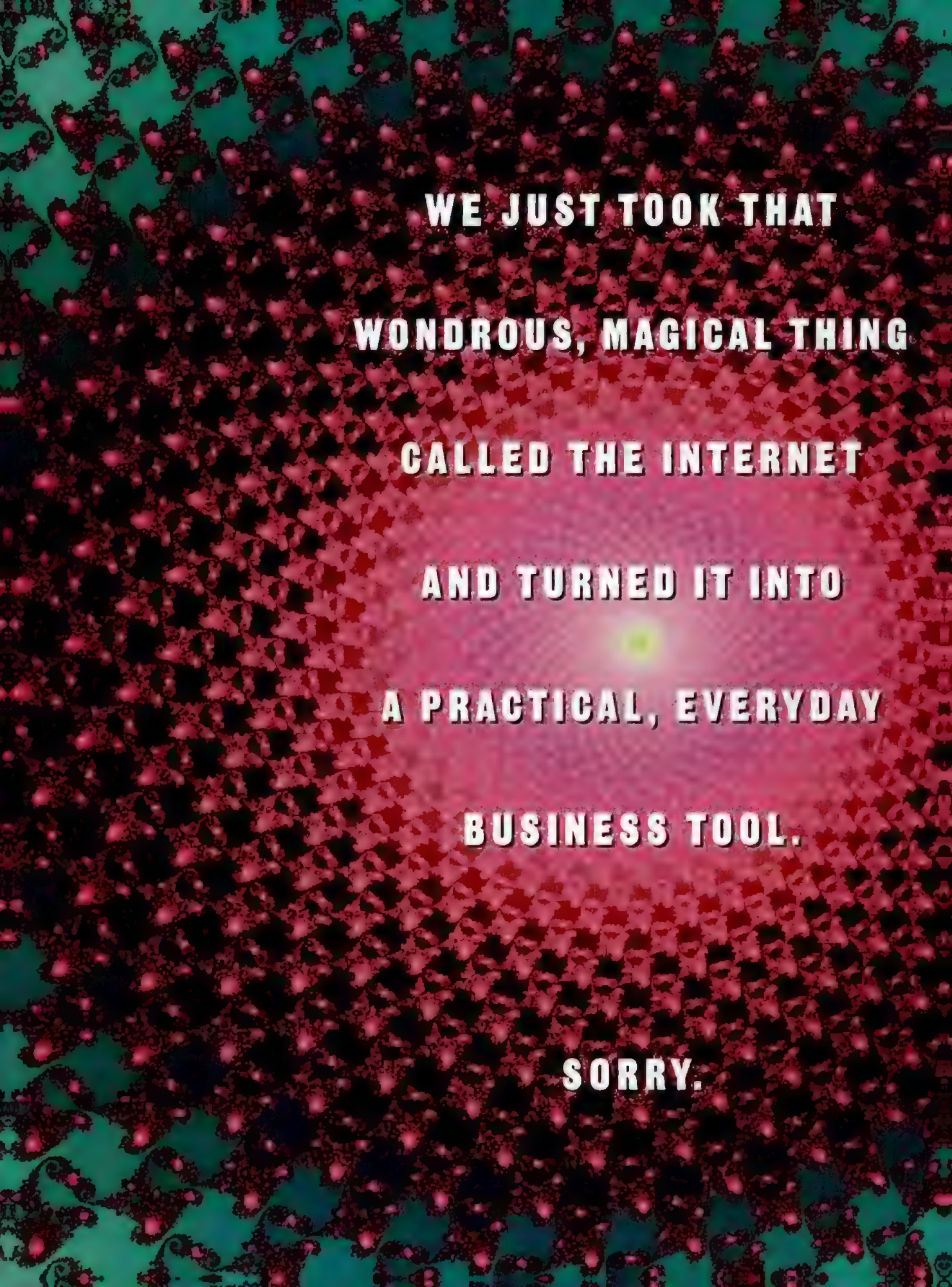
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Second Looks

WEB SOFTWARE

The Internet's Taller Tower of Babble

It may not rival the abilities of Star Trek's universal translator, but Globalink's Web Translator can produce a rough conversion between English and several foreign languages (First Looks, May 28, 1996, page 51). The original program quick-

frequently deal with industry-specific, academic, or technical terms.

While the program has added support for Italian translations, Web Translator still gets hung up on graphics. For the most part, Web Translator 1.1 did a workmanlike job, but it did get stuck on a sentence describing a car's trunk on the Peugeot Web site: "Equipée d'une banquette arrière rabattable, elle autorise le transport d'objets d'envergure" was translated as "Escapade of a beating rear

Escapade of a beating rear bench, it authorizes the transportation of objects of scale. With options such that the air conditioning, tinted panes or the device antibloilage of wheels, it offers you a comfort and a supplementary security to the daily

ly translated the text in a French, German, or Spanish Web page into English, or vice versa, although quite often something got lost in the translation. But if

bench, it authorizes the transportation of objects of scale."

A few minutes spent customizing the dictionary made for better translations the second time around. For the increasingly international Web, the French adage that the more things change, the more they remain the same rings truer every day.

DIGITAL IMAGING

Camera Ins and Outs

Digital cameras have been proliferating, but the lack of inexpensive, high-quality color printers has made digital photography largely a one-way street. Digital Light & Color's Picture Window (First Looks, August, 1994) changed that with image-editing software and a high-quality print-making service that can turn your PC into a digital darkroom.

Our experience with Picture Window over the last two years has generally been positive, and the program has brought many hobbyists into the world of digital photography. But the program's features seemed too rudimentary and at times it was quite slow.

The latest evolution of Picture Window is Version 1.2; the \$18.90 upgrade can be ordered from DLC's Web site (www.dl-c.com) or on CompuServe (GO DLIGHT). In addition to adding some powerful new image-editing tools—such as red-eye removal, saturation and brightness controls, and a mask tool for working with

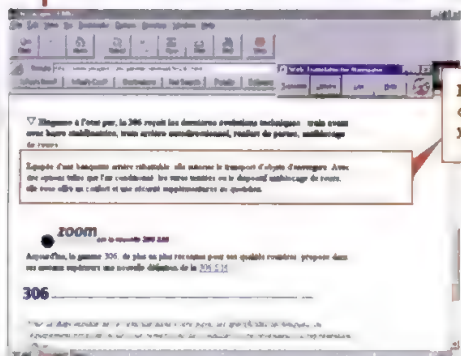
brightness curves—there's also a marvelous texture transformation that can turn any image into abstract art.

The biggest improvement, though, is speed. Most operations are noticeably faster—particularly those for resizing images

and preparing the picture for DLC to print—which gives rise to a wonderful feeling of interactivity. Photos range from \$3.95 to \$7.95 for 8.5- by 5.5-inch and 8.5- by 12.5-inch glossy or matte prints, to \$12.95 for a 8.5- by 12.5-inch Ciba-chrome professional-quality print.

All in all, Picture Window makes getting high-quality color images out of your PC as easy as it is to get them in.

SECOND LOOKS MAILBOX: Tell Second Looks about your experiences with computer products. Contact Brian Nadel via MCI Mail (556-1500), CompuServe (72241,1616), or the Internet (bnadel@zd.com).



you treat its results skeptically, Web Translator is great for the linguistically challenged.

Version 1.1 of Web Translator addresses many of our original concerns. For one, the update to this multilingual program, which is a free download for registered users of Version 1.0, has a reworked dictionary that now includes an editor so that you can correct the program's vocabulary errors. This feature is especially useful if you

GRAPHICS CARDS

The Great GXE Trade Up

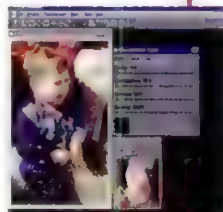
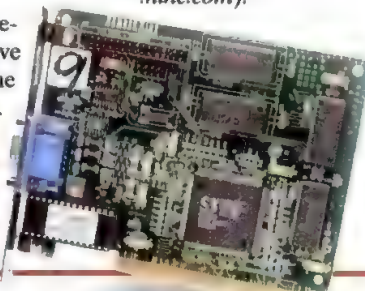
A number of readers have stuffed the Second Looks mailbox with cries concerning problems they're having with Microsoft Windows 95 and the Number Nine GXE graphics board that came with their Dell Dimension XPS systems. The original PCI version of the Number Nine GXE graphics board has had problems running in Windows 95 from day one, because the board's circuitry was based on an early PCI bus specification.

All is not lost, however, because Number Nine will give you a discount on any of the company's other products. For example, you can trade up from the 32-bit GXE card for the newer, much more compatible, 64-bit 9FX Real-

ity 332 card for \$159; the 2MB card usually sells for \$199.

Although a software upgrade or free hardware swap would have been nicer, you do get a lot of graphics card for the money, including Windows 95 and Windows NT compatibility, an extra megabyte of video memory, and the ability to run full-screen video playback.

For details on this program, call Number Nine at 800-438-6463 or visit its Web site (www.nine.com).



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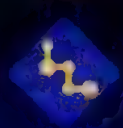
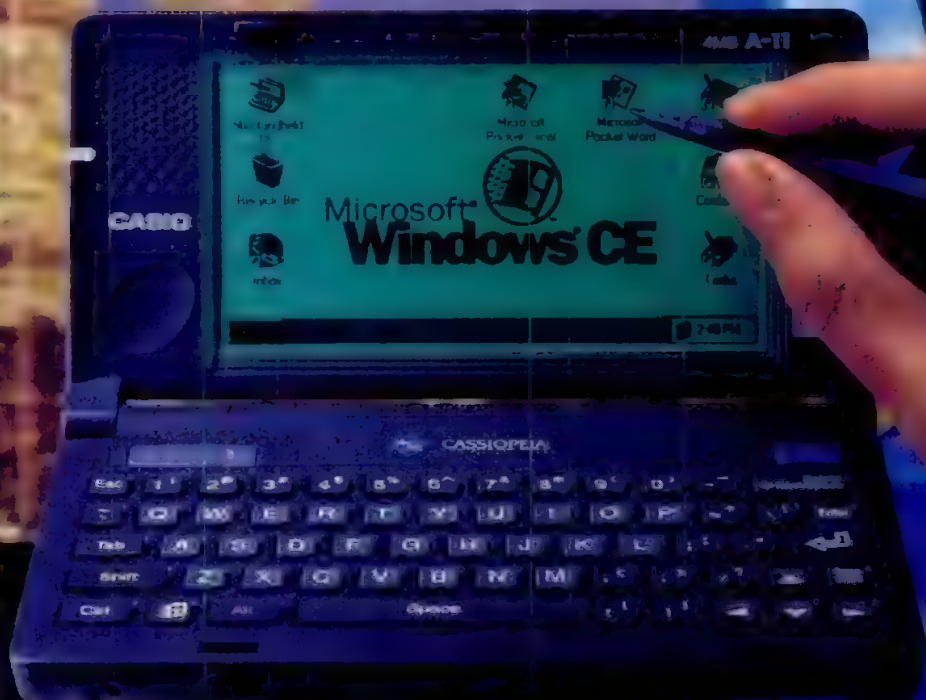
- Creatively retouch images or generate special effects using the included Adobe® PhotoDeluxe™ and ISR iXlaPhoto™ software.
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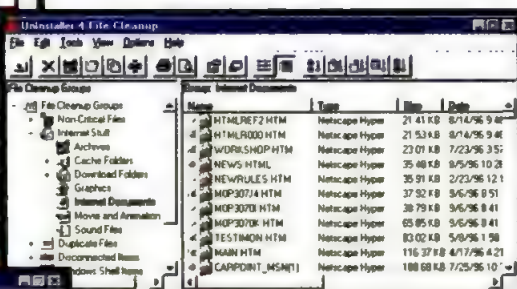
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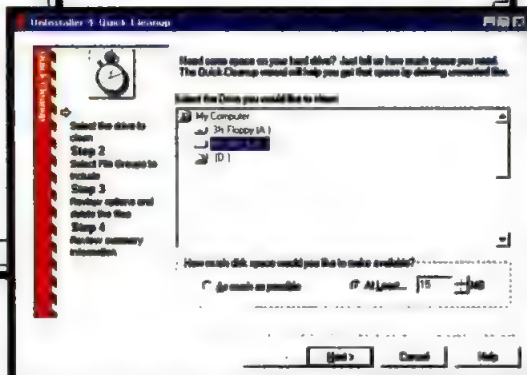
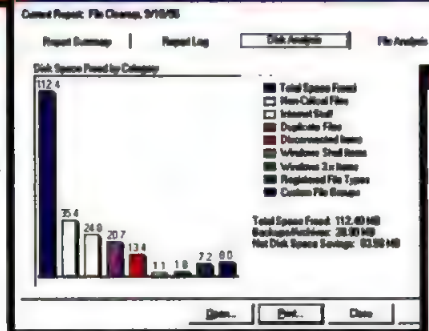
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HEY, EVERYONE CAN USE A LITTLE HELP.

CIRCLE 214 ON READER SERVICE CARD

Can You Help the Gang?

The members of this gang don't fit the stereotype. They're laughing, running around, shooting each other—with water pistols. They're members of the Hole in the Wall Gang, named after Paul Newman and Robert Redford's gang in *Butch Cassidy*

and the *Sundance Kid*. And the gang leader is none other than Paul Newman.

Newman is the president and founder of the Hole in the Wall Gang (HITWG) Camp, a sleep-away camp for kids with life-threatening illnesses. His goal was to create a place where kids of all races and incomes could laugh and play, sing and shout, meet other children with similar problems, and, at least for a while, forget about being sick and "raise a little hell." The kids attend the camp free of charge, and they find themselves in a world that accommodates their illnesses and special needs without the self-consciousness, lack of specialized medical care, or potential for injury that might be found in a regular camp.

The original HITWG camp, tucked into a rural corner of eastern Connecticut, is part of an international network of camps that includes the Boggy Creek Gang Camp in Florida, the Double H Hole in the Woods Ranch in New York state, Ireland's Barrestown Gang Camp, L'Envol in France, and the Silver Lining Ranch in Colorado. The Connecticut camp, which handles 800 campers per year, looks like a Wild West frontier town, complete with wooden sidewalks and an OK Corral. The head of pediatrics at Yale-New Haven Hospital, Howard Pearson, serves as the camp's medical director.

The Hole in the Wall Gang Fund provides support to all of the above camps, but also relies heavily on donations and volunteers. The camp publishes a wish list (www.amsquare.com/camp/wishlist.html) that covers everything from arts-and-crafts supplies to equipment for the horse stable. HITWG administrators are sometimes amazed at the unpredictable response to the list—an electric golf cart and 800 35-mm cameras were received almost instantly, but there's still no lead on plain white T-shirts.

Not surprisingly, the camp has wanted to make its presence felt online in order to tell the rest of the world what it's up to, to keep in touch with and expand the universe of donors and volunteers, and, most important, to give the kids a way of staying in touch with one another. Anyone who's had a life-threatening disease or watched a loved one strug-

gle with a terminal illness knows how important support groups can be. As of this writing, the camp is somewhat underrepresented on the Web, although the wish list and its parent page, at www.amsquare.com/camp, are good starting points. Another good place to look is Phi Kappa Tau's

site, www.phikappatau.org/phil. The Hole in the Wall Gang is one of the chief beneficiaries of its philanthropic activities.

As Larry Berger, creative director of the camp's Hole in the Web project, says, "These camps provide life-changing experiences for hundreds of children who attend each summer. Yet our campers often return home to a long year of hospital stays, isolation from friends, and a constant awareness of the limitations imposed by their diseases. It has been hard to maintain the magic of camp beyond the summer."

Berger and his associates hope to build a computer network that enables campers to stay in touch year-round. "It was our campers who took the lead in this," he says. "The network was 'invented' by a camper named Daniel who was receiving 'good luck' e-mails on his laptop right up until he went in for major surgery, and 'congratulations' e-mails as soon as he woke up."

Such support is vital to a child's recovery, and Berger would like to replicate it for every camper. He says that 100 to 150 machines, divided between laptops and desktops, will put them in business, forming a base they can install at the camps and in the hospitals, and lend to campers.

They're not looking for state-of-the-art equipment, just something that can run a Web browser. Multimedia capabilities would be nice, but the real need is child-to-child and child-to-counselor communication. Some of the kids with computer access already have pen pals all around the world. The rest could use that kind of support.

So if you have a machine that's gathering dust and are wondering what to do with it, or if you're looking for a particularly worthwhile cause to support, here's your opportunity. Contact Liz Marshall, c/o The Hole in the Wall Gang Camp, 565 Ashford Center Rd., Ashford, CT 06278; 617-426-1991; www.modemmedia.com/portfolio/hitwg; campout@aol.com. □



GRANT A WISH
Paul Newman's camp for sick kids needs a network of computers so kids can keep in touch.

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Avoiding Information Overload

I suppose it was when someone coined the term "Internet Year" to describe a period of about a month that I decided to deal with today's time management crisis. Unquestionably, it seems more is happening on the computer scene today than ever before.

And we all seem to be working harder. But I've concluded that working harder isn't helping much. We have to work smarter.

Until the filtering mechanisms on the Web and for e-mail are substantially improved, all of us parked in front of our PCs are going to continue wasting far too much time. There are only about 16 usable hours in a person's day, and having access to all the information in the world doesn't change that simple fact.

I once said that the computer industry always seemed like it was moving fast to outsiders, but if you were in the business it was like flying in a 747: While the people on the ground saw you doing 600 miles per hour, you were in fact perfectly at ease inside the plane. The Internet can give us the impression that the pace of change has accelerated, but it really hasn't. Just look at the true forward motion: ISDN, a decade-old technology, is only now undergoing broad distribution. All those other pie-in-the-sky bandwidth schemes—such as ADSL and cable modems—were hot stuff a year ago, but little has happened since.

The simple fact is that the Web and the Net revolution have removed the natural barriers between us and the carloads of information we would normally never see. The loss of these natural filters is problematic, and the only solution is to create filters artificially that reestablish a wall between ourselves and the information floodwaters. Here are some strategies you can use: **Block e-mail.** Although I've always advocated universal e-mail, I never imagined that people would go crazy and write more letters than ever before. With regular mail, creating and sending a letter involves several steps: You have to get paper; write and edit the letter; print it, if necessary; fold it; find a stamp; and mail it. You had to be sincerely interested in communication to go through this rigmarole. Nowadays, with e-mail, you can simply open an editor, type out a comment, and hit the send button. Sending e-mail is so easy, people often express opinions they might otherwise have kept to themselves.

In other words, a natural filter has been removed from written communication. The result has been a flood of unimportant messages. The solution: Set up a private, unpublished box for associates and relatives. Send all other mail elsewhere. This is like having two telephone lines: a

personal line and a business line. You may even consider setting up various in-boxes to sort your incoming mail automatically. **Watch the clock.** The Web is a time killer. You begin your session looking for a coffee distributor, for example, and at that site, you see a link to a site on rare chocolates. You jump to that site, and before you know it, you've learned more than you ever wanted to know about the history of the chocolates. Enough already.

There are two things you can do to avoid this time trap. First, stay focused on what you're trying to find rather than following random links. The second step is to limit your research to a fixed time before you go online. Otherwise, you'll wind up on the Web until 4 A.M. Give yourself 45 minutes or perhaps an hour and then just stop. Time limits are great filters.

Positive reinforcement. Just because you have a library card doesn't mean you're required to read every book in the Library of Congress. With the Web at 70 million or more pages, there's no way anyone can keep on top of it all. Relax. Don't worry if you don't know about some new technology. If someone brings it up in conversation, have him brief you

on it. And don't put up with friends who say, "What? How can you not know about that? Have you been hiding under a rock or something?"

Print, print, print. Finally, use your printer as much as possible when researching on the Web. When you hit interesting pages, send them to the printer immediately and move on to the next item. This way, you can gather as much information as possible without spending all night online or chasing useless links.

The idea is to create some filters to cut down on all the noise from the Net. Such filters may be the key to preserving our sanity in today's information glut.



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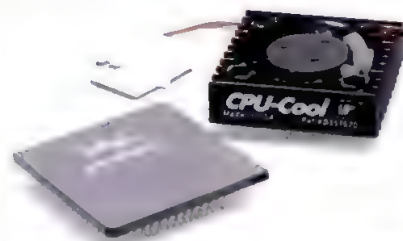
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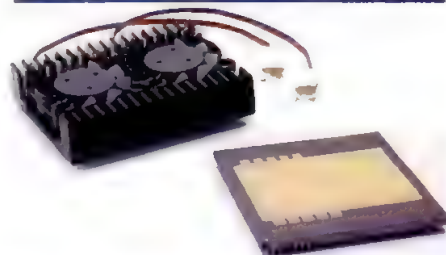


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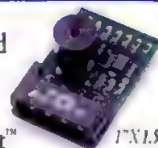
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Inside Track

Where Will It End?
Dept.: As many of you probably know, the on-line world is **abuzz over 56-Kbps modems**, simultaneously developed

by three companies: Lucent Technologies, Rockwell, and Texas Instruments. Rockwell appears to be the first out of the box, already shipping chips, and we should see modems on retail shelves this month. One market-research group says that in 1997 there will be **12 million sold**. Meanwhile, there has been a debate about the actual throughput of this modem. Most say that few 56K-to-56K links will actually hit top speed unless one of the 56K connections is ISDN or better. Since most ISP connections tend to be T1-based, the likelihood of making a 56-Kbps connection with one of these new modems should be enhanced. So don't hesitate to try them.

I believe modem makers should be required to put LCDs on modems to indicate true transmission speed so users can complain to their phone companies about **shoddy connections**. I've talked to people around the country who tell me that with 28.8-Kbps modems they are seldom getting online faster than 21 Kbps. The solution is to **complain to the phone companies**.

Still Baffled by Previous Claims: What baffles me is the possibility of 56 Kbps in the first place. In the early 1980s, I heard over and over that the absolute theoretical limit on voice-line data-transmission speed was 19.2 Kbps. Then along came the 28.8-Kbps modem. How was this possible? Then I was told that the theoretical limit was 40 Kbps, and maybe someday someone would make a 40-Kbps modem. I was also told that the 40-Kbps modem would need near-perfect line conditions to operate. Next thing that happens is a 56-Kbps modem. Can't these guys get it straight? But whatever the case, this is good news.

What About Cable Modems and ADSL? **Dept.:** I'm sure that, as I write this, board meetings are taking place regarding ADSL and cable modems. Cable-modem testing has been underway for over a year and ADSL trials are now beginning in certain areas. Pacific Telesis is expected to initiate what it terms xDSL in various parts of California.

All of this is driven by a perceived **demand for faster Web access**, of course. I believe there is some faulty thinking here. First of all, a 28.8-Kbps connection through a good provider that actually delivers full speed creates a satisfying Web experience. I've used T1, ISDN, 28.8, and 14.4—and **I can live with 28.8**. Most of the delays on the Net have to do with site contact and slow remote servers, not local speed (though this doesn't apply to large .GIFs, obviously). Most **Web developers are attentive to bandwidth limitations**; most Web site software is designed to tighten

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 should be required
 to put an LCD on
 modems indicating true
 transmission speed so
 users can complain
 to their phone
 companies about
 shoddy connections.*

up service and improve efficiency with new technologies, such as Flash-Pix; and most books on Web design concentrate on efficient techniques. Higher bandwidth will reverse this positive trend. Most of the world will access the Web at 28.8, 33.6, or the new 56 Kbps. We won't see cable modems and ADSL for a good five years, according to most industry insiders. The speeds of those services typically vary between 1.5 Mbps and 10 Mbps.

The sleeper in these access wars is the **local power company**. It has the poles and the wires and would love to hook up all of its customers to a high-speed network for the sole purpose of **remote meter reading**, which would save millions in personnel costs. Someone came up with the bright idea that along with remote

meter reading, power companies could also give the public **cheap or even free Internet access** over the same system. Heck, they could do telephony and cable TV, too, while they're at it. Let me tell you that every cable and phone company is watching local power companies closely.

Microprocessors March On Dept.: At the recent Microprocessor Forum in San Jose, **the buzz was over the slew of so-called media processors** on the horizon. I believe the development of these chips, which are designed to process large bandwidth data streams (such as a broadcast signal), is what **triggered the development of MMX**. It was thought that MMX would take the wind out of the media processor's sails. But because it's late to market, MMX may arrive into an evolving scene in which much more will be expected than can actually be delivered. We're into the second generation of media processors, yet still no MMX chip can spew out a 640-by-480, 30-frames-per-second, full-color video "movie." But if a media processor can do the same thing at 1,024-by-768 or 1,280-by-1,024, then people will demand the higher performance, and we'll end up with MMX and media processors in the same box. The cost benefits of MMX will be instantly wiped out by the never-ending demand for more power. The hot product at the conference was a chip from **Chromatics Research** that runs at a whopping 6 billion operations per second.

Back into the War: Meanwhile, AMD announced that it, like Cyrix, will provide **MMX capability** in its **upcoming K6**—a chip designed to compete with the Pentium Pro but be pin-compatible with the Pentium. By reentering the market, AMD should take some of the heat off Cyrix, which seems to have been targeted by Intel and has suffered for it. AMD is rolling out a series of ads intended to get the same attention as the "Intel Inside" campaign. I've seen a few of these ads, and it looks as if AMD is going to take credit for the entire growth of Western Civilization since Charlemagne. □

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Destination: Redefinition of the Home PC

Back in March, I told you about my experiments with kids and large-screen computers. Not just 17-inch or even 21-inch monitors, but *really* big ones—like the 30-inch and larger TV sets becoming commonplace in our homes. In that column (“Kids and

Computers: A New Paradigm,” March 26, 1996), I observed that children not only loved playing games and “edutainment” CD-ROMs on computers hooked up to one of these bug-eyed sets, but they actually began interacting very differently with the programs. And often with other kids who joined them in front of the screen.

Any parent of a young child with a PC in the house can tell you that as much fun as kids can have at a PC, and as valuable as the learning resources available on CD-ROMs these days are, having more than one kid sitting down at a PC can be a recipe for disaster. All that good behavior aunts and uncles like to brag about goes out the window, and too often the session descends into a “Give me the mouse!” shouting match.

I’m convinced that’s because the physical setting of a child at a typical desktop PC precludes effective interaction by more than one child at a time. Even with those rare titles that try to draw in several kids, the one kid/one PC rule holds.

For some time I’ve been experimenting with large-screen TVs as toys and tools for small groups of kids, and kids and their parents, trying to break through that isolation. This has meant tripping over a tangle of wires as the scan converter fed a so-so image from the PC over to the TV set, and as keyboard and mouse extension cables snaked through the room.

Back in January, Gateway started showing its new big-screen Destination PC to a few editors. I worked with one and, as I wrote here, was enthusiastic and hopeful. But I’ve been led down the path too often in this business. I promised you a real review after I’d seen a real production unit.

My family and I, and our troupe of preschool-age testers, have been living, working, and playing with a real, same-as-you-can-buy Destination for some time now. To cut to the chase: It’s a great system, if not for everyone, and you’re missing a bet if you don’t at least consider the Destination when you next look for a home PC.

The PC is a standard Gateway 166-MHz Pentium or

180-MHz or 200-MHz Pentium Pro box. It’s black, and designed to fit as well on a deep bookshelf as on the floor, but there’s nothing special about it: nice, fast, perfectly okay. Inside that box, though, Gateway installs an unusual video card that drives the unit’s 31-inch Super VGA

monitor. In addition to supporting 640-by-480 (and *only* 640-by-480) resolution, with a long palette, as a computer display, the monitor can also show a good TV picture delivered by that same video card and its 166-channel cable-ready video tuner, or from an attached VCR, laser disk player, or video camera.

That’s right: This is both a big-screen PC and a semi-big-screen TV. High-quality audio from an Ensoniq sound card can be piped out to headphones, to your existing stereo system, through amplified speakers, or to a \$699 Harman-Kardon surround-sound audio rig that Gateway offers as an option.

As a TV, the Destination is pretty good—but you could buy an equivalent 31-inch TV for \$800 or so. TV use is going to be a distinctly secondary function of Destinations.

As a computer? Well, your first thought, like mine, may be that a 640-by-480 display is too low-res to be very useful. *Wrong-o.* At any reasonable viewing distance—say, 4 feet to 15 feet or more—that 640-by-480 image works fine. A few times I wished I could crank it up to 800-by-600, but when I thought about it, I realized that system fonts and other details would be too small to see at that higher resolution.

The Destination really comes into its own as a game machine. Whether you’re running one of the great *Freddi Fish* or *Pantsylvania* little kids’ titles or blasting away in *DOOM* or *Quake*, you’ll love that big, bright picture. It’s also great for Web browsing and for using reference materials such as Microsoft’s *Encarta Encyclopedia* or a route-mapping program. The Destination’s hand-held, TV-remote-like device with cursor and mouse controls is a natural for gamers.

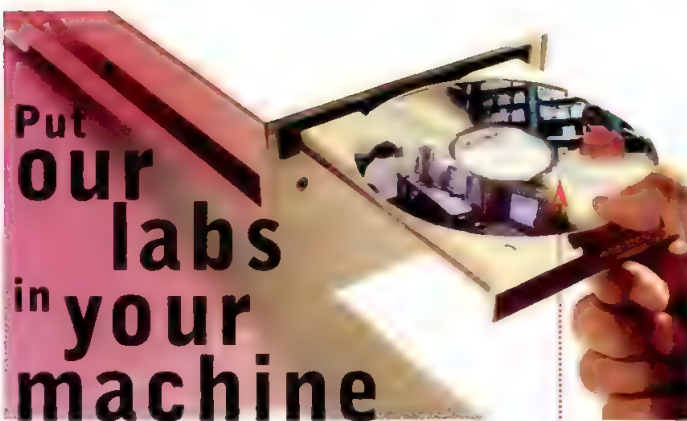
Results from using the machine as a general-purpose home PC—for Mom and Dad to check e-mail, write reports,



TAKING TURNS

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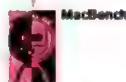
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JIM SEYMOUR

struggle with spreadsheets, and so on—are mixed but probably reflect widely varying personal tastes and senses of privacy. I loved reading e-mail and writing in Word for Windows on the Destination's huge display. But other adults I've sat down in front of the machine were less enthusiastic, though the naysayers did say that with a little more time at the system they thought they might like it as much as I do.

One issue is where you like to put your keyboard—and whether you're used to working with it in your lap. I am, and so I found that sitting back, legs crossed, with the Destination's RF-wireless keyboard/touch pad in my lap, was bliss. One of my friends said he could never work like that: He could think seriously only when he was sitting up straight, feet on the floor, fingers on a keyboard set on a desk-top, “where it belongs.”

I also wonder if concerns about how well a big-screen PC/TV like the Destination functions as a workday extender are really relevant. I don't think the Destination is going to be a first-and-only home PC for very many families but rather the machine Mom and Dad buy mainly for the kids, to keep 'em off the other PC at home that's used regularly for after-hours work.

The Destination's price alone—\$2,999 to \$4,799, depending on CPU, memory, and hard disk size—already means it's not going to be every family's choice: That's twice what you could pay for a decent home PC. And if it becomes mainly a second PC, that restricts it even further, to those families that can afford two expensive information appliances.

A note on Destination audio: The H-K system offered as an option by Gateway is a modest one. You'll get better sound for \$200 less with a \$499 Cambridge SoundWorks bundle consisting of a Pioneer surround-sound receiver plus SoundWorks speakers. And if you don't need the AM/FM tuner and surround sound of a receiver, you can get really superb two-channel stereo out of the new Cambridge SoundWorks' MicroWorks-powered speaker system, for just \$329.

And a hot tip: Though sold as a home PC, the Destination makes a *killer* conference-room system for businesses.

Whether the Destination will be an instant hit in your home depends on your computing and TV-viewing habits and those of your kids. But fair warning: To see it is to want it, and to live with one for a couple of weeks is to decide you have to have it.

Dear Santa Claus. . . □

Toy Stories

By now, Universal Serial Bus (USB) should have been universally available. I was sure of it. Wrong. The medium-speed bus will allow you to connect multiple keyboards, mice, printers, personal scanners, and label printers to your PC without ever running

out of I/O ports or interrupt request lines. USB is much like the Apple Desktop Bus, and yes, it's better technically, but it was developed late in the game. Unfortunately, USB is on only a handful of PCs and virtually no peripherals. But a couple of gizmos have cropped up to perform some of the tasks USB will eventually do. Other accessories simply make using your PC a bit more enjoyable. Here's my personal list of six of the top hardware accessories.

Siamese mice. What if you want to use a trackball and mouse simultaneously, or have one mouse for you and one for the kids? Several vendors make devices that will let you. The devices have the best (sometimes the only) chance of working if they use the same driver. The widest selection comes from P.I. Engineering (800-628-3185; www.sojourn.com/~whymouse). WhyMouse, WhyKeyKey, and DigiDapter, which let you connect two pointing devices, two keyboards, and a digitizer and a pointing device, respectively, off single ports, each sell for \$49.95 (list). Microsoft and MicroSpeed offer similar solutions.

Modem adapter for digital PBXs. Sharing a modem or fax machine and a telephone on the same line, or auto-dialing your phone with your PC, are easily done—if you have an analog line. But in the office, you're more likely to have a digital phone. Konexx (800-275-6354; www.konexx.com), has a direct PBX connection device that manages incoming and outgoing modem or fax calls. The DWInt, for Nortel (Northern Telecom) phones, is \$225 direct; models for other digital PBXs are coming soon. It's not a lot of money compared to running a dedicated analog line.

Speakerphone. Most telephone speakerphones are useful for hands-free typing, but the sound quality is so-so. Special-purpose conference-room speakerphones sound good, but they can run you \$1,000. Here's one that sounds great for half the price: the \$400 Conference Link CS1000 full-duplex conferencing speakerphone from U.S. Robotics (800-342-5877; www.usr.com). It's not cheap, but it's not a bad deal, either. Like its pricier competitors, the CS1000 looks like a three-legged starfish painted black.

You could, by the way, use it with a digital PBX via a Konexx DWI coupler (don't connect it directly). Also available is the similarly priced U.S. Robotics CS1050, which connects to your PC's sound adapter for desktop videoconferencing or for higher-quality sound using Internet phones.

Tabloid ink jet color printer. Epson makes a superb tabloid-size ink jet for graphic artists, but it costs \$2,000. Here's an everyday ink jet printer that gives you good output for \$500 (street): Canon's BJC-4550 (800-848-4123; www.ccsi.canon.com). It has all the bells and whistles of the Canon 4000-series printers: the Canon Creative software for greeting cards, T-shirts, posters, and so on, plus the ability to print with photo-realistic or neon inks. The BJC-4550 also takes 11- by 17-inch paper for producing miniposters or megaspreadsheets. Unfortunately, my favorite home CAD program, Broderbund's 3D Home Architect, is restricted to 8.5- by 11-inch output. Please, Broderbund: Get with the program. Most every other software application prints automatically on tabloid-size paper.

Computer desk. If you want a computer desk that you can move about, one of the most rugged is the AnthroCart from Anthro Corp. (800-325-3841; www.anthro.com). You can order an AnthroCart from 18 inches to six feet wide, with multiple shelves, accessories, and baskets. The main typing surface can be adjusted in one-inch heights. Sure, it looks like what it is—a desk on wheels—but if you have modern decor, it will fit in nicely. Expect to pay anywhere from \$300 to \$700 (direct) for the basic units and half that again if you accessorize.

Laptop paper clip. You've seen those paper-holding clips that attach to your desktop PC. Fellow columnist Jim Seymour turned me on to one that does the same thing for portable PCs: Fellowes' \$6.50 Laptop Copy-Grip (800-945-4545, www.fellowes.com). It's a clear plastic clip the size of a clothespin. You attach it with Velcro to the side of your LCD panel, and it holds a couple of sheets of paper. The ingenious device is very useful in cramped spaces, such as airplanes. You can use it on a desktop monitor, too. □



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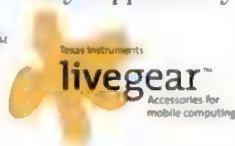


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thirteenth annual

TECHNICAL EXCELLENCE

Awards



By Michael J. Miller

TECHNICAL EXCELLENCE is a very rare commodity. Many computer products are well thought out, solidly built, and bug-free, but only a few demonstrate that spark of a real breakthrough. Technical excellence results from an imaginative process that goes beyond refining existing categories to visualizing something new.

Still, we can't remember a year when we've seen so many striking innovations, or when the ability of our industry to reinvent itself and move in new directions was more in evidence. Much of this has to do with the ferment of the Internet, but it is true in many other categories too, from PC system design to programming tools to games.

This story celebrates the year's top creative achievements in personal computing and the people who made them happen. For the 13th year running, a team of *PC Magazine* editors and PC Magazine Labs personnel spent months debating the merits and drawbacks of the thousands of products that passed through our labs during the year. Our 10 winners and 19 finalists were selected for having made a unique and significant contribution to the PC industry. To be eligible, products had to ship during the period from October 1, 1995, to September 30, 1996. In our next issue, *The Best of 1996*, we look at the industry from a different perspective, picking the most mature and powerful products. But here we honor the groundbreakers that will shape the future.

DESKTOP SYSTEMS

Winner: Toshiba Infinia

Gary Elsasser, Peter Ashkin, Ed Matsukane, Jeffrey Friederichs, Richard Sagey, Keith Comer, John Matsumoto



MANY COMPANIES HAVE built PCs for use in the home, but few have achieved the successful integration of computer and consumer electronics that Toshiba has pulled off with its maiden entry into the home computer market.

Toshiba's Infinia PC line is topped by the high-end Model 7200, which packs all the latest multimedia components and makes them easier to use than ever before. It has an impressive set of built-in FM radio and TV tuner controls, an 8X CD-ROM drive, an answering machine, and fax and speakerphone functions. The TV reception is the best we've seen on any PC, and you can capture screens through the

standard Family Album Creator from Creative Wonders. The In-Touch module, which attaches to the front of the monitor, provides an easy way to control these varied elements.

Toshiba didn't stop there. An instant-on feature reduces the time for rebooting the system, and

a remote control makes it possible to access the multimedia features wirelessly. Toshiba offers an optional 17-inch monitor that features integrated speakers on the side and a subwoofer below. Under the hood, the Infinia has the core components you expect in a high-end home PC, including a 200-MHz Pentium processor, 256K of external cache, and a 3GB hard disk.

Toshiba has previously won Technical Excellence Awards for its outstanding portables, but its stylish debut into the home PC market sets a new standard for multimedia home computers.

■ *Toshiba America Information Systems Inc., Irvine, CA; 800-334-3445; computers.toshiba.com.*



Finalist: Gateway Destination Big Screen PC

Mark Rapaich, Randy Farwell, Brian Bennett, Ron Brabander, Steve Weidner, and Jeff Schindler

THE FIRST HOME COMPUTER TRULY DESIGNED FOR the living room, the Gateway Destination Big Screen PC combines a powerful PC with an RF wireless keyboard, a remote control, and a 31-inch VGA monitor that doubles as a TV screen. A built-in TV tuner and optional Harmon Karden sound system let you plug in your VCR and cable-TV connection to create a new kind of home entertainment center. PC applications look fabulous on its large screen, bringing a new dimension to everything from games to Web surfing. You can also reduce the viewing area to a window while using computer programs.

With its 31-inch screen, built-in STB TV tuner based on a Brooktree chip set, and wonderful sound system, the Destination is an impressive leap in component selection and bundling.

■ *Gateway 2000 Inc., North Sioux City, SD; 800-846-2000; www.gw2k.com.*

Finalist: HP Vectra XU 6/150

Jonathan Sharon, Raphael Gay, Phillippe Moennen-Occoz, Claus Hirtzman

HEWLETT-PACKARD CO.'S PENTIUM PRO-BASED HP Vectra XU 6/150 packs features that make it the new standard for high-end workstations. One of the first units to use Intel's 450KX PCIset chip set, it was also one of the few to add ECC memory so it could use this chip set's built-in ECC controller.

Moreover, the Vectra was the first Pentium Pro to incorporate a 128-bit wide-memory bus and DIMM sockets instead of industry-standard SIMMs. It has an integrated Ultra SCSI-2 controller, a 2GB Fast SCSI-2 hard disk, a Matrox Millennium graphics card, a 10/100-Mbps Ethernet PCI card, and a gold capacitor instead of a battery to maintain CMOS memory. HP's 6/180 and 6/200 models now replace the 6/150. Other vendors offer similar feature sets, but HP set the standard they strive to meet.

■ *Hewlett-Packard Co., Palo Alto, CA; 800-752-0900; www.hp.com.*

APPLICATION SOFTWARE

Winner: Netscape Navigator 2.0

Alex Edelstein, Tom Tsao, Mike Homer, Bob Lisbonne, and the Navigator 2.0 Development Team



THERE'S LITTLE QUESTION that 1996 was the year of the browser. For many of us, the browser became our primary desktop application, the tool for gleaning the riches of the Internet and, increasingly, the intranet. It was also the year when the browser changed from a simple HTML viewer into a platform for the multimedia and interactive content of today's World Wide Web.

Netscape Navigator 2.0 was responsible for most of these changes. This release (which just missed the deadline for last year's awards) introduced Navigator Plug-Ins, third-party browser extensions that brought unprecedented power and flexibility to Web pages. It was also the first browser to support an internal

scripting language, Netscape's own JavaScript. It was the first browser to support HTML Frames and a number of other innovative HTML extensions that changed the look of Web design. Finally, it was the first commercial browser to support Java, the most significant new programming platform in years and the winner of a Technical Excellence Award last year.

The result has been nothing less than a redefinition of personal computing. Browsers are now among the most common applications—perhaps the single most common application. Web sites are quickly becoming graphically richer and far more interactive. And applications developers are rushing in droves to learn Java in order to write applications for this new environment. Navigator 3.0 (re-



leased this August) adds still other features, such as integrated collaboration and multimedia tools. But Navigator 2.0 was a computing milestone, the product that changed the Web browser from an application into a platform.

■ *Netscape Communications Corp.*, Mountain View, CA; 415-937-2555; home.netscape.com.

Finalist: Microsoft Internet Explorer 3.0

The Microsoft Internet Explorer 3.0 Team

THE MOST AMAZING THING ABOUT INTERNET EXPLORER is how quickly Microsoft changed it from a me-too browser into a competitive and compelling application platform. Internet Explorer 3.0's most important feature is ActiveX, a retooling of Microsoft's COM platform that is the first real component standard on the Internet. Internet Explorer 3.0 lets developers build rich, interactive Web or intranet applications using prebuilt ActiveX components. Its other strengths include support for both the JavaScript and Microsoft's homegrown VBScript scripting languages. It was also the first browser to offer cascading stylesheets, and its implementation of Java is unrivaled.

Today, ActiveX is limited to 32-bit Windows. But Microsoft plans on taking it to other platforms and has provided the specification to an open committee that will oversee its development.

■ *Microsoft Corp.*, Redmond, WA; 800-426-9400; www.microsoft.com.

Finalist: Salsa for the Desktop

David Kroenke, John Nicol, and the Salsa Development Team

SALSA FOR THE DESKTOP TAKES A UNIQUE AND INNOVATIVE approach to personal data management. The concept sounds simple: You design a custom interface for the database application you want, and Salsa builds a database to power it.

To create an application, you drag and drop objects, such as the names of products, from a catalog onto Salsa's work surface. When you've finished, Salsa builds the underlying database. Few users will care about the sophisticated relational theory or data-modeling engine at work. But these parts of the program operate with rigorous exactitude. This approach, called *Semantic Object Modeling*, lets your conception of your business data shape the way you work with it. The technology lets you view your information holistically and concentrate more on your business than on programming concerns.

■ *Wall Data Inc.*, Seattle; 800-987-2572; www.salsa.walldata.com.

PORTABLE SYSTEMS

Winner: IBM ThinkPad 560

Takane Fujino, Kenichi Kawashima, Masahiko Nagai, Shinji Ohishi, Robert Sachsenmaier, Tetsuo Shiroshto



WHEN YOU ENCOUNTER the IBM ThinkPad 560 for the first time, your immediate impulse is to ask, "How did they make it so thin?" The answer: by means of the marvelous engineering and packaging that have long been hallmarks of the IBM ThinkPad line.

At 11.8 inches wide by 8.8 inches deep, an astonishingly small 1.3 inches thick, and just a hair over 4 pounds without the battery charger, the ThinkPad 560 redefines the very concept of portability in computing. Even with the charger, the system weighs only 4.7 pounds, making it one of the lightest Intel-based units ever made.

The ThinkPad 560 is no lightweight when it comes to features,

however. The unit has a superb 12.1-inch, 800-by-600 active-matrix display, as well as a full-size 19-mm keyboard and IBM's third-generation Advanced TrackPoint III pointing device. The system also includes an infrared port to facilitate transferring files to your desk-



top, as well as an expansion port for a port replicator. You won't want for power either, since the current model boasts a 133-MHz Pentium processor together with a 1GB hard disk. IBM completes this remarkable union of power and portability by tying it all together with a strong and lightweight carbon fiber chassis.

Other portable systems, including others from IBM, offer more raw performance. But no other machine can match this winning combination of performance and portability. With its wonderful keyboard, great screen, and sleek, light design, the IBM ThinkPad 560 provides road warriors with a better tool than they've ever had before.

■ **IBM Corp., Armonk, NY; 800-426-2968; www.ibm.com.**

Finalist: U.S. Robotics Pilot 5000

Art Lamb, Monti Boyer, Rob Haitani, Jeff Hawkins, Ron Marianetti

THE U.S. ROBOTICS PILOT 5000, A HANDWRITING-enabled personal organizer, is truly a small wonder. Measuring 0.6 by 4.6 by 3.1 inches and weighing just 5.5 ounces, this PDA fits in a shirt pocket yet delivers useful tools for personal information management. Its small LCD screen is readable in almost all lighting conditions. The Pilot has no keyboard, modem, or PC Card slot. Instead, it comes with a small docking cradle that connects to your PC, letting you synchronize the Pilot's calendar and address book with versions running on your Windows desktop. You can also enter data directly into your Pilot using its Graffiti handwriting recognition system. The Pilot is simple, practical, and relatively affordable (around \$300), an elegant breakthrough in the world of very little computers.

■ **Palm Computing Inc., a division of U.S. Robotics, Mountain View, CA; 800-881-7256; www.usr.com/palm.**

Finalist: Toshiba Tecra 720CDT

Gary Elsasser, Philip Osako, Jeffrey Friederichs, Hidehito Murato, Keith Comer, James Mason, Tak Tsubouchi

THE TOSHIBA TECRA 720CDT, PERHAPS THE MOST capable portable ever built, delivers three impressive new technologies in one groundbreaking product. It was the first portable with a 12.1-inch, 1,024-by-768 active-matrix XGA display, one of the largest and clearest in the industry. It was the first with CardBus, the new standard for more capable PC Cards. And it was the first with a Zoomed Video port, which bypasses the PCI bus for large video streams.

Other highlights include a 133-MHz Pentium CPU, a capacity of up to 144MB of RAM, a flexible SelectBay options slot for a 6X CD-ROM drive, a 1.3GB hard disk, and a built-in modem. Toshiba has recently replaced this model with the 730CDT, which ups the ante to a 150-MHz Pentium CPU and a 2GB drive.

■ **Toshiba America Information Systems Inc., Irvine, CA; 800-334-3445; computers.toshiba.com.**



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GRAPHICS SOFTWARE

Winner: Kai's Power GOO

Kai Krause, Phil Klevinger, Ben Weiss, Andrea Pessino, Athena, Jim Klingshirn, Chris Livingston, John Wilczak



KAI'S POWER GOO has a simple interface, but beneath that deceptive front lies an amazing amount of graphics power. Once you load an image in Kai's Power GOO, you can push, pull, and otherwise manipulate it as though you were finger painting or playing with putty. You can either alter the image in real time or record your changes as an animation for later playback.

What really takes place under the covers is that a graphics engine called Amazon creates an intermediate version of your original image, then applies it as a texture to a grid that consists of over 100,000 triangles. The image that you see on the screen is merely a proxy of that model.

When you manipulate the image, you actually move the vertices of the triangles, which in turn change the wire frame on which the image is displayed. As you enlarge, shrink, push, pull, smudge, or nudge the image, the program records changes in the positions of the triangles in the grid. As a result, you can easily reapply, undo,



or even record and play back these changes. You can also easily zoom and pan, in part by means of a two-pass smoothing algorithm that is applied to the proxy.

Even more impressive, all of these changes take place on the fly, and the program is quite fast even on relatively limited systems. It can produce an animated version of your changes as .AVI or QuickTime movies, so look for GOO to become a force for weird animation on the Web in the very near future.

GOO looks simple, but as with many of Kai's other products, simplicity is just a mask for some incredibly advanced technology.

■ *MetaTools Inc., Carpinteria, CA; 800-472-9025; www.meta-tools.com.*

Finalist: Fractal Design Expression

Alex Hsu, Water Lou, Sai-leung Su and Irene Lee (Creature House Ltd.); Pierre Berkaloff, John Stockholm, Emil Valkov

THERE'S A BIG DIFFERENCE BETWEEN DRAWING WITH physical media and with a computer. Yet with the innovative Fractal Design Expression, your drawings give the impression that you used nonvirtual media. Like the company's Fractal Design Painter, Expression lets you take advantage of pressure-sensitive tablets. But while Painter is a bitmap program, Expression does all its work with vectors.

Expression's Skeletal Strokes technology lets you create components made up of multiple elements, all on a single pass. Strokes can mimic traditional tools, such as paintbrushes, pencils, and pens. The program can even create simple animations using its Multi-view strokes. Expression gives you the feel of paint and brushstrokes, combined with the flexibility of vector-style editing.

■ *Fractal Design Corp., Scotts Valley, CA; 800-846-0111; www.fractal.com.*

Finalist: Softimage

Claude Cajolet, Allan Thorpe, Rejean Gagne

AS PERSONAL COMPUTERS BECOME MORE POWERFUL, 3-D graphics are no longer the sole province of specialized workstations. Microsoft acquired Softimage, a leader in 3-D graphics on the Silicon Graphics platform, a few years ago. A new Softimage release for Windows NT has brought cutting-edge three-dimensional animation into the personal computer orbit.

Softimage delivers tremendous control over dynamics—for example, its ability to model the effects of gravity, wind, or waves. Its Mental Ray rendering engine, available only with the Extreme version of Softimage, allows programmable ray tracing that can easily handle everything from hair to cartoon shading. Softimage boasts the richest animation features of any product we've seen, and it's the unsurpassed leader in motion capture. With its new Softimage, Microsoft brings industrial-strength 3-D to the wider world of Windows NT.

■ *Microsoft Corp., Redmond, WA; 800-576-3846; www.softimage.com.*

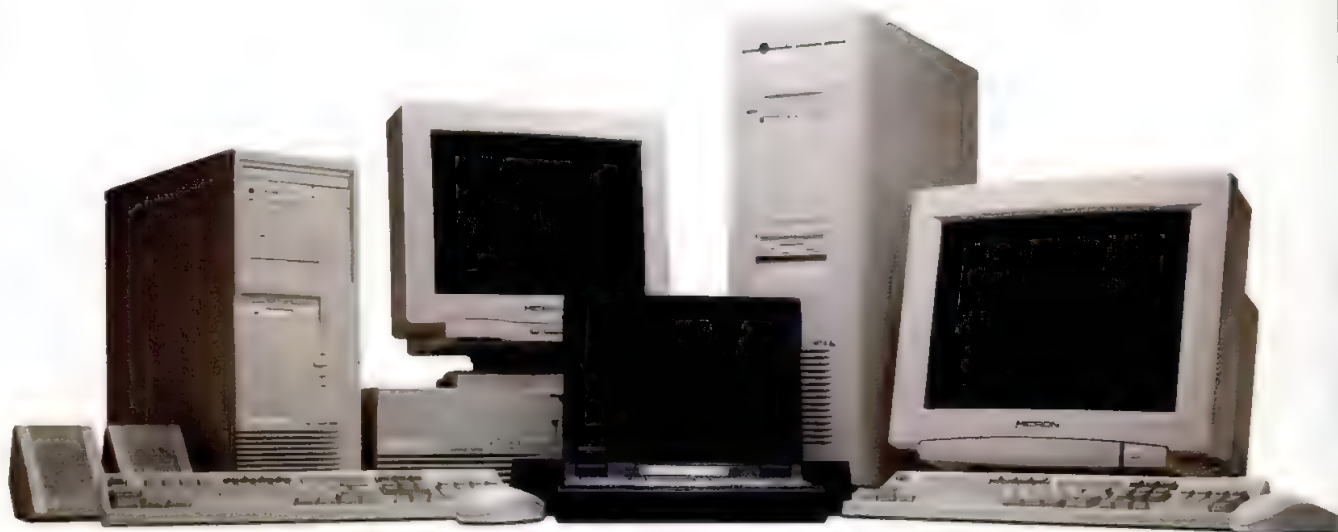


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- 64MB EDO RAM
- 9GB Fast SCSI-2 hard drive
- 17" Micron 17FGx, 26dp (15.8" display)
- Microsoft Office Pro 95 & Bookshelf® 95 CDs

\$4,799
Bus. lease \$163/mo.

FAMILY MULTIMEDIA SOLUTIONS

Home MPC™ P133

With Intel 133MHz Pentium processor

street \$200

- Intel 133MHz Pentium® processor
- 512KB pipeline burst cache, flash BIOS
- 16MB EDO RAM
- 1.6GB EIDE hard drive
- 12X EIDE CD-ROM drive, 3.5" floppy drive
- 16-bit stereo sound & speakers
- 28.8 fax/modem, speakerphone, voice mail
- Microsoft® Phone telephony software
- Internet ready
- Free 1 month Spry® Internet access, Microsoft Internet Explorer® 3.0
- Prodigy®, America Online® & CompuServe® trial memberships
- PCI 64-bit 3D video, MPEG, 2MB EDO RAM

- 15" Micron 15FGx, 28dp (13.7" display)
- Tool-free minitower or desktop
- Microsoft Mouse, 104-key keyboard
- Microsoft Windows® 95 & MS® Plus! CD
- Quicken® Financial Pak includes: Quicken Deluxe 5.0, Quicken Financial Planner®, Quicken Parents' Guide to Money® and Quicken Family Lawyer®
- Family Pak includes: ABC by Dr. Seuss, Thinkin' Things® Collection 1, Earthworm Jim® and MechWarrior® 2
- Microsoft Home Pak includes: Works 4.0, Publisher Deluxe, Encarta® Encyclopedia, Monster Truck Madness, CD sampler, plus more!
- 5-year/3-year Micron Power warranty

\$1,899

Home MPC™ P200

With Intel 200MHz Pentium processor

street \$180

- Intel 200MHz Pentium processor
- 512KB pipeline burst cache, flash BIOS
- 32MB EDO RAM
- 2.5GB EIDE hard drive
- 12X EIDE CD-ROM drive, 3.5" floppy drive
- 16-bit 3D WaveTable stereo sound card
- Advent® AV270 2x25 watt stereo speakers
- 28.8 fax/modem, speakerphone, voice mail
- Microsoft Phone telephony software
- Internet ready
- Free 1 month Spry Internet access, Microsoft Internet Explorer 3.0
- Prodigy, America Online & CompuServe trial memberships
- PCI 64-bit 3D video, MPEG, 2MB EDO RAM

- 17" Micron 17FGx, 26dp (15.8" display)
- Tool-free minitower or desktop
- Microsoft Mouse, 104-key keyboard
- Microsoft Windows 95 & MS Plus! CD
- Microsoft Office Pro 95 & Bookshelf® 95 CDs
- Quicken Financial Pak includes: Quicken Deluxe 5.0, Quicken Financial Planner, Quicken Parents' Guide to Money and Quicken Family Lawyer
- Family Pak includes: ABC by Dr. Seuss, Thinkin' Things Collection 1, Earthworm Jim and MechWarrior 2
- Microsoft Home Pak includes: Works 4.0, Publisher Deluxe, Encarta Encyclopedia, Monster Truck Madness, CD sampler, plus more!
- 5-year/3-year Micron Power warranty

\$2,899



A New Millennium

Micron's Millennium Pro
Flies High With 200MHz
Of Pentium Pro Power

37 Products Reviewed

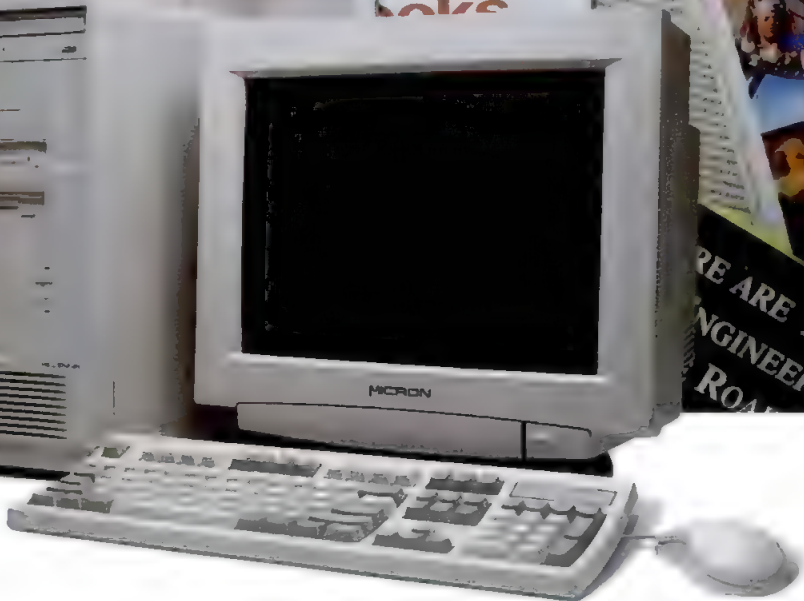
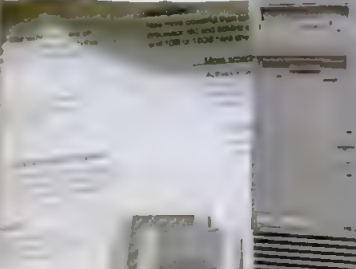


Corel 3D CAD



Hewlett-Packard LaserJet GP

55



Fast, Friendly
Flowchart

Put to rest your
apprehensions
about DRAM graphics
cards being slow. With
an S3 Viper accelerator
and 2MB of DRAM, the
Diamond Stealth 3D
2000 board pumps pixels

RE ARE TWO
ENGINEERED
ROAD

Outstanding Performance—Don't Take Our Word for It.

Talk is cheap when you're speaking for yourself. But when it's from the mouth of an industry expert, it carries weight. Here are a few of many examples of what they're saying about Micron PCs:

Micron Home MPC™ "... the fastest we've ever tested . . . as well as a marvelous family package . . . it wins our Top Rated award" —Family PC, May 1996

Micron Millennium™ "In short, Micron covers all the bases with this Best Buy" —PC World, March 1996

Micron PowerServer™ "This is definitely a best buy" —Computer Shopper, January 1996

Micron Millennium TransPort™ "...nearly a dead ringer for IBM's ThinkPad... but performs better and saves you about \$2,500." —PC Magazine, April 1996

The Right System for You

Micron makes a suite of outstanding solutions designed for the way you work or play. From home systems to servers, desktop PCs to portable multimedia solutions, Micron always comes through with a system built to satisfy. For details and prices, turn the page.

Micron Power

Warranty & Support

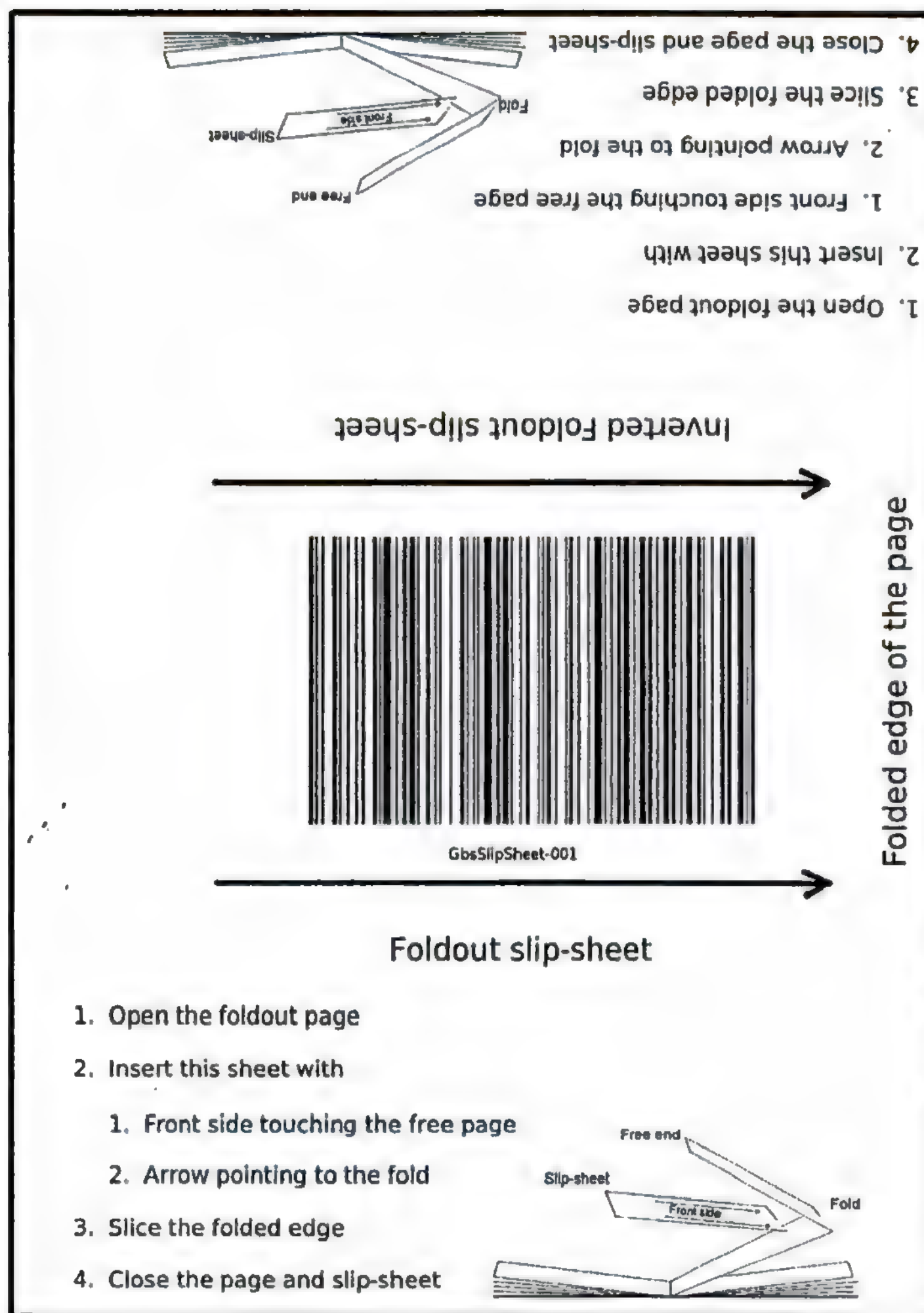
- 5-year limited warranty on microprocessor and main memory
- 3-year limited parts-only system warranty
- 1-, 2- or 3 year optional on-site service agreement for Micron desktop and server systems
- 30 days of free Micron-supplied software support for Micron desktop systems; 3 optional network operating system incident resolutions included for Micron server systems
- 30-day money-back policy
- 24-hour technical support

See Micron website for complete details. Terms and conditions of our warranty apply. *Optional. For more information, contact Micron at 1-800-707-2329.

MICRON
ELECTRONICS, INC.

800-707-2329

<http://www.mei.micron.com>



1. Follow instructions on the other side

Inverted Back



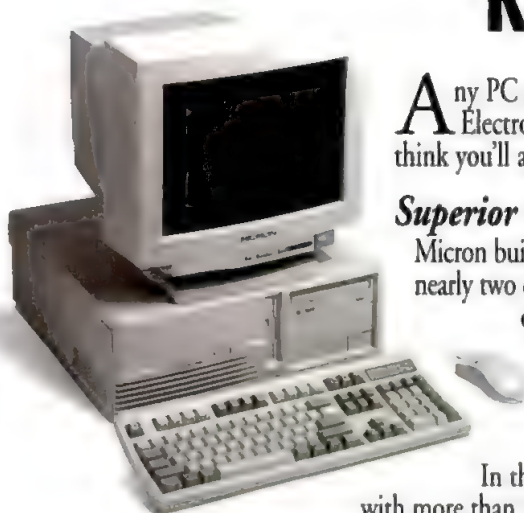
Gbs5lipBack-0018

Back

1. Follow instructions on the other side



DISCOVER FOR YOURSELF WHY MICRON KEEPS RECEIVING ACCLAIM.



Any PC maker can claim to offer a solution that covers your needs. But at Micron Electronics[®], we prefer to let our history and our products speak for themselves. We think you'll agree it's an impressive story.

Superior Manufacturing—A Micron Tradition

Micron builds PCs with a legacy of excellence. Our manufacturing processes grew out of nearly two decades in the semiconductor business, where precision is measured in millionths of an inch, and quality in parts per million. We've built strategic relationships with companies like Intel, Microsoft and Novell. From this solid background, we're forging unbeatable systems you can count on today and tomorrow.

Award-Winning Products

In the past two years, leading industry publications have applauded Micron PCs with more than 170 awards for product performance, customer service and support. This includes *PC Magazine's* Best Products of 1995 and Editors' Choice awards in several categories. Add more than 40 *PC World* Best Buy awards and you've got an impressive technology hall of fame.

Recognized Service and Reliability

After your purchase, the story continues. Just ask *PC Magazine* readers. They bestowed on us the coveted Readers' Choice for Customer Service and Reliability in 1994 and 1995. And *PC World* recently awarded us first-tier status along with the likes of Apple, Compaq, Digital and HP. Pretty good company, wouldn't you say?

Micron PowerSM Warranty—An Industry First

We support our reliability promise with the industry-leading Micron Power warranty. It backs the microprocessor and main memory for five years, an industry first. Add a three-year, parts-only system warranty and a 30-day money-back guarantee, and you can rest assured that you're in good hands.

SERVER SOLUTIONS

Vetix™ EL 1000N

With Sony 4/8GB DOS-2 SCSI DAT tape back-up drive add \$599
*Vetix EL 1000 and 2000 models available with Microsoft Windows NT Server. Call for pricing.

- Intel 200MHz Pentium® Pro processor
- Dual Pentium Pro ZIF sockets
- 256KB L2 cache, flash BIOS
- Memory upgradable to 512MB
- Slots: 1 ISA, 3 PCI, 1 shared PCI/ISA
- Adaptec® PCI 32-bit Ultra SCSI Fast-20 controller
- 12X SCSI-2 CD-ROM drive, 3.5" floppy drive
- 64-bit 1MB ISA video
- 3Com® 3C595 Fast EtherLink® PCI 10/100 NIC (RJ-45)
- Full-size tower with 10 drive bays
- 15" Micron 15FGx, .28dp (13.7" display)

- Microsoft® Mouse, 104-key keyboard
- Novell® NetWare® 4.X (5 user license)
- NOS support (3 resolutions)
- 5-year/3-year Micron Power® warranty

- 32MB ECC RAM
- 2GB Ultra SCSI hard drive

\$4,499
Bus. lease \$153/mo.

- 64MB ECC RAM
- 4GB Ultra SCSI hard drive

\$4,999
Bus. lease \$170/mo.

Vetix™ EL 2000N

With Sony 4/8GB DOS-2 SCSI DAT tape back-up drive add \$599
*Vetix EL 1000 and 2000 models available with Microsoft Windows NT Server. Call for pricing.

- Dual Intel 200MHz Pentium Pro processors
- 256KB L2 cache, flash BIOS
- Memory upgradable to 512MB
- Slots: 1 ISA, 3 PCI, 1 shared PCI/ISA
- Adaptec® PCI 32-bit Ultra SCSI Fast-20 controller
- 12X SCSI-2 CD-ROM drive • 3.5" floppy drive
- 64-bit 1MB ISA video
- 3Com® 3C595 Fast EtherLink® PCI 10/100 NIC (RJ-45)
- Full-size tower with 10 drive bays
- 15" Micron 15FGx, .28dp (13.7" display)
- Microsoft® Mouse, 104-key keyboard

- Novell NetWare 4.X (5 user license)
- NOS support (3 resolutions)
- 5-year/3-year Micron Power warranty

- 64MB ECC RAM
- 4GB Ultra SCSI hard drive

\$5,799
Bus. lease \$182

- 128MB ECC RAM
- 9GB Fast SCSI-2 hard drive

\$6,999
Bus. lease \$218

CORPORATE NETWORK SOLUTIONS

ClientPro™ P120

With Intel 133MHz Pentium processor add \$50

- Intel 120MHz Pentium® processor
- 256KB pipeline burst cache, flash BIOS
- 16MB EDO RAM
- 3Com® 3C509 ethernet ISA NIC (BNC, AUI & RJ-45)
- 3.5" floppy drive
- PCI 64-bit graphics accelerator, 2MB EDO RAM
- Tool-free minitower or desktop
- Microsoft® Mouse, 104-key keyboard
- MS-DOS® 6.22/Windows® for Workgroups 3.11
- Microsoft Works preinstalled
- 5-year/3-year Micron Power® warranty

- 1.2GB EIDE hard drive
- 14" Micron 14FGx, .28dp (12.9" display)

\$1,499
Bus. lease \$51/mo.

- 2.1GB EIDE hard drive
- 15" Micron 15FGx, .28dp (13.7" display)

\$1,699
Bus. lease \$58/mo.

ClientPro™ 2 180

- Intel 180MHz Pentium® Pro processor
- 256KB internal cache, flash BIOS, DIMM support
- 3Com® 3C509 ethernet ISA NIC (BNC, AUI & RJ-45)
- PCI 64-bit graphics accelerator, 2MB EDO RAM
- 3.5" floppy drive
- Tool-free minitower or desktop
- Microsoft® Mouse, 104-key keyboard
- Microsoft Windows NT® Workstation 4.0
- 5-year/3-year Micron Power warranty

- 16MB EDO RAM
- 1.2GB EIDE hard drive
- 15" Micron 15FGx, .28dp (13.7" display)
- Microsoft Works preinstalled

\$1,999
Bus. lease \$68

- 32MB EDO RAM
- 2.1GB EIDE hard drive
- 15" Micron 15FGx, .28dp (13.7" display)
- Microsoft Office Pro 95

\$2,299
Bus. lease \$78

- 32MB EDO RAM
- 3.1GB EIDE hard drive
- 17" Micron 17FGx, .26dp (15.8" display)
- Microsoft Office Pro 95

\$2,599
Bus. lease \$88

HIGH-PERFORMANCE SOLUTIONS

Millennia™ Pro2 180

With 2nd Intel 180MHz Pentium Pro processor add \$599
With Microsoft Windows NT Workstation 4.0 CD add \$99
*Second processor requires Microsoft Windows NT Workstation 4.0

- Intel 180MHz Pentium® Pro processor
- Supports dual Intel 180MHz Pentium Pro processors
- 256KB internal cache, flash BIOS
- 12X EIDE CD-ROM drive, 3.5" floppy drive
- 16-bit stereo sound & speakers
- PCI 64-bit 3D video, MPEG, 4MB EDO RAM
- Tool-free minitower or desktop
- Microsoft® Mouse, 104-key keyboard
- Microsoft Windows® 95 & MS® Plus! CD
- 5-year/3-year Micron Power® warranty

- 16MB EDO RAM
- 2.5GB EIDE hard drive
- 15" Micron 15FGx, .28dp (13.7" display)
- Microsoft Works 95 CD

\$2,199
Bus. lease \$75/mo.

- 32MB EDO RAM
- 3.1GB EIDE hard drive
- 17" Micron 17FGx, .26dp (15.8" display)
- Microsoft Office Pro 95 & Bookshelf® 95 CDs

\$2,699
Bus. lease \$92/mo.

Millennia™ Pro2 360 Plus

- Dual Intel 180MHz Pentium Pro processors
- 256KB internal cache, flash BIOS
- PCI 32-bit Ultra SCSI Fast-20 controller
- 12X SCSI CD-ROM drive, 3.5" floppy drive
- 16-bit stereo sound & speakers
- PCI 64-bit 3D video, MPEG, 4MB EDO RAM
- Tool-free minitower or desktop
- Microsoft Mouse, 104-key keyboard
- Microsoft Windows NT® Workstation 4.0 CD
- Microsoft Office Pro 95 & Bookshelf® 95 CDs
- 5-year/3-year Micron Power warranty

- 32MB EDO RAM
- 2GB Ultra SCSI hard drive
- 15" Micron 15FGx, .28dp (13.7" display)

\$3,699
Bus. lease \$126

- 64MB EDO RAM
- 4GB Ultra SCSI hard drive
- 17" Micron 17FGx, .26dp (15.8" display)

\$4,549
Bus. lease \$155

- 128MB EDO RAM
- 9GB Fast SCSI-2 hard drive
- 21" Micron 21FGx, .26dp (20.0" display)

\$6,799
Bus. lease \$214

PORTABLE SOLUTIONS

Millennia TransPort™

- Mobile Intel Pentium® processor
- Intel 430MX PCI chipset
- 256KB L2 pipeline burst cache
- BX modular CD-ROM drive
- PCI graphics accelerator, 1MB EDO RAM
- Pick-a-Point™ dual pointing devices integrate both pointing stick and touchpad
- Removable EIDE hard drive
- 3.5" modular floppy drive
- Intelligent modular lithium-ion battery
- 16-bit stereo sound
- Built-in stereo speakers and microphone

- 2 Type II or one Type III PCMCIA slots
- S-video and NTSC-video outputs
- Headphone, microphone and line-in jacks
- 2 infrared ports, one front, one back
- Parallel, serial, VGA and 2 PS/2® ports
- Dimensions: 11.7" x 9.4" x 2.0", weight: 6.9 lbs.
- Nylon carrying case
- Microsoft® Windows® 95 and MS® Plus! CDs
- Microsoft Office Pro 95 and Bookshelf® 95 CDs
- Kensington™ security lock ready
- 5-year/3-year Micron Power® warranty

† 6.9 lbs. includes 3.5" floppy and one battery.
†† Lock secures both Millennia TransPort and MicroDock.

- 133MHz mobile Intel Pentium processor
- 32MB EDO RAM (48MB max.)
- 12.1" active matrix color display, 800x600
- 1.3GB removable hard drive

\$4,099
Bus. lease \$139/mo.

- 133MHz mobile Intel Pentium processor
- 32MB EDO RAM (48MB max.)
- 12.1" active matrix color display, 800x600
- 2.1GB removable hard drive
- Motorola® Montana 33.6 fax/modem
- 2nd lithium-ion battery

\$4,599
Bus. lease \$156/mo.

OPTIONS

- With 16MB DIMM module upgrade add 349
- With 33.6 fax/modem add 259
- With 2nd lithium-ion battery add 199
- With primary 2.1GB hard drive upgrade add 100
- With MicroDock™ multimedia port replicator add 299
- With MicronExec™ desktop package add 799
- With car adaptor add 89



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Make a Great PC Even Better!

Custom configure your new Micron Electronics system with these popular options.

MULTIMEDIA OPTIONS

- 16-bit 3D Waveable stereo sound.....\$59*
- 16-bit 3D Waveable stereo soundcard w/2MB RAM.....\$99*
- Advent AV270 Powered Partners stereo speakers.....\$99
- Advent AV370 Powered Partners stereo speakers w/subwoofer.....\$199
- Microsoft® SideWinder™ 3D Pro joystick.....\$59



STORAGE/MEDIA OPTIONS

- Adaptec® 2940U Ultra SCSI Fast-20 controller.....\$100
(upgrade from system with standard Ultra SCSI Fast-20 controller)
- Plexor 12Plex 12X 1.8MB/S SCSI internal CD-ROM drive.....\$200**
(upgrade from systems with standard 12X EIDE CD-ROM drive)
- Iomega Jaz SCSI drive with 1.0GB removable cartridge.....\$399**
- Iomega Zip IDE drive with 100MB removable cartridge.....\$99
- Iomega 6-pack of 100MB Zip cartridges.....\$99
- Iomega Ditto 800 (400/800MB) Travan Tape back up w/tape.....\$149
- Iomega Ditto 3200 (1.6/3.2GB) Travan Tape back up w/tape.....\$199
- Sony 4/BBB DDS-2 DAT SCSI Tape back up w/tape.....\$999**



COMMUNICATION OPTIONS

- 33.6kb V.34 internal data/fax modem.....\$139***
- 28.8kb V.34 internal telephony data/fax modem
w/full duplex speakerphone and voice mail.....\$159****

NETWORKING OPTIONS

- 3Com® 3C509 ethernet ISA NIC (BNC, AUI & RJ-45).....\$99
- 3Com 3C595 Fast Etherlink® PCI 10/100 NIC (RJ-45 only).....\$159
- SMC ISA TokenCard network card.....\$199

QUICKEN® FINANCIAL PAK

- Quicken Financial Pak, including: Quicken Deluxe S.O.B.; Quicken Financial Planner™; Quicken Parents' Guide to Money™; Quicken Family Lawyer™.....\$69
(available only on desktop systems with Windows 95)

* Upgrade from systems with standard 16-bit stereo sound card

** Requires SCSI Host Adapter

*** V.34 modem includes trial memberships to CompuServe®, Prodigy® and America Online®

† Requires sound card

†† Upgrade from systems with standard Micron 17" 1776x color monitor

††† Upgrade from systems with standard 64-bit 2MB video card

Options and accessories available with system purchase only.

CIRCLE 370 ON READER SERVICE CARD
OR GO TO WWW.PCMAG.COM/ProductLink

EDVENTURE PAK

- EdVenture Pak, including: Shaka Ray, the Brave; Putt-Putt® Saves the Zoo™; Reader Rabbit's Reading Development Library™ 1; Froddi Fish™ and the Case of the Missing Kelp Seeds™; and the Thinkin' Things™ Collection 2.....\$69
(available only on desktop systems with Windows 95)

DISPLAY/VIDEO OPTIONS

- 17" Hitachi SuperScan 1711 (15.9" display) .26dp color monitor.....\$150 ††
- 21" Hitachi SuperScan 2111 (20" display) .26dp color monitor.....\$650 ††
- P9 Imagine 128 series II video card w/4MB VRAM.....\$500 †††
- P9 Imagine 128 series I video card w/8MB VRAM.....\$750 †††

MILLENNIA TRANSPORT OPTIONS

- MicronDock™ multimedia port replicator: ethernet 10BT LAN adapter, SCSI-2 port, S-video and NTSC-video output, built-in stereo speakers, infrared port, headphone, microphone, line-in jacks, parallel, serial, VGA and 2 PS/2 ports.....\$299
- MicronExec™ desktop package: matching black 17" monitor (15.8" display) with matching black mouse, mousepad and keyboard (can be used with or without MicronDock).....\$799
- Motorola Montana 28.8 fax/modem supports regular telephone connections, cellular phones and two-way paging devices.....\$259
- Intel 150MHz Pentium processor.....\$200
- 3Com® ethernet 10BT PCMCIA.....\$149
- Samsonite® leather bag.....\$99
- 2nd modular Lithium-ion battery.....\$199
- 2nd hard drive (1.3GB).....\$599
- 2nd hard drive (2.1GB).....\$699
- 16MB DIMM module upgrade.....\$349
- 32MB DIMM module upgrade.....\$749
- Card adapter.....\$89



SERVICE OPTIONS

- Extended 2-year on-site service coverage for desktop systems.....\$99
(upgrade from optional 1-year on-site service coverage)
- Extended 3-year on-site service coverage for desktop systems.....\$139
(upgrade from optional 1-year on-site service coverage)
- Complete on-site PC installation (call Micron Electronics for details).....\$159

OTHER OPTIONS

- APC® Pro/7T surge suppressor.....\$99
- APC Pro/7T surge suppressor.....\$59
- Microsoft® Natural Keyboard®.....\$49
(upgrade from standard keyboard)

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THE BOSS' EGO



Megahertz is now part of U.S. Robotics,
giving you greater innovation and reliability.
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Megahertz is pleased to let you know that they've joined the U.S. Robotics family to bring you complete end-to-end mobile communications solutions that are more advanced. More reliable. Basically, better than ever before. To find out what else we can do to make your day easier, call 1-800-LINKING, ext. 4323, or just visit us on the World Wide Web at www.usr.com/megahertz. This may not solve all of your problems. But it's a start.

U.S. Robotics
Mobile Communications

NETWORKING HARDWARE

Winner: DirecPC

Doug Dillon, Bob Cassagnol, Dung Huynh, Aaron Falk, Ilya Faenson, Bill Stanton, Jorge Guzman, Mark Petronic, Ramesh Belani, Boris Rekhman, Ken Burrell, Vivek Gupta, Satyajit Roy, Sherry Lou



EVERYONE TALKS ABOUT cable modems, 56-Kbps modems, and other fast ways to connect to the Internet, but most of the really high-speed technologies either are not available yet in most locations or are too complex for average users.

One impressive exception to the trend is Hughes Network Systems' DirecPC. With this system, you simply add to your PC a board that hooks to a small satellite dish. The board is a receiver that listens to a satellite downlinked to the Internet. The result is a system that offers very fast Internet access for both home and corporate users: up to 400-Kbps access for normal downloading from the Web, with peak speeds of up to

3 Mbps. The technology works for everyone regardless of the local telephone company or location.

Right now, DirecPC is one-way only. You must use a traditional dial-up connection operating at normal modem speeds to send data to the Internet; this is the so-called *back channel*. But for most

of us, downloading data from the Internet is the main interest anyway. Hughes plans to introduce new technology that will let users both send and receive data directly through the satellite.

The combination of satellite communications technology and PC interfacing is innovative and unique. The DirecPC installation is practically invisible in your PC, but it offers high speeds to locations virtually anywhere in the continental United States where there is some view of the southern sky. Wireless technologies of all kinds are the data-delivery wave of the future. This one is here today.

■ *Hughes Network Systems Inc., Germantown, MD; 800-347-3272; www.direcpc.com.*



Finalist: Fluke OneTouch Network Assistant

OneTouch Network Assistant Design Team

FLUKE'S NETWORK TEST EQUIPMENT HAS ALWAYS been top-flight, but its OneTouch Network Assistant surpasses the company's own high-water mark. This diagnostic tool kit looks like a PDA but has no buttons or controls, just a touch screen.

Hooked to a 10- or 10/100-Mbps network, it maps the nodes, attaches names to each network station, shows IP and IPX addresses, and shows the cable distance between LAN nodes. An LED lights if the unit discovers any network errors, cable faults, or jabbering nodes, and offending nodes are highlighted on the screen. The box describes and diagnoses many aspects of LAN operations on its own and can also read network configuration information from routers and other devices. With a great interface and powerful diagnostics, this is a must-have for network managers and installers.

■ *Fluke Corp., Everett, WA; 800-443-5853; www.fluke.com/nettools.*

Finalist: T4 Cogent Fast Ethernet by Adaptec

Jeff Stockdale

NETWORKING TECHNOLOGY KEEPS GETTING FASTER, and 100-Mbps Ethernet is the new standard. But many network managers can't simply write off investments or make major new investments in installed cable systems in order to move bits faster.

Cogent, now part of Adaptec, saves both your technology investment and the cabling installed behind your walls with a Fast Ethernet adapter family that can send data over existing Category 3 or Category 4 cable systems. Products in the T4 Cogent Fast Ethernet line use all four pairs of wire in the cable to make high-speed connections. This technology delivers high-speed networking without the expense of changing cabling. The Cogent adapters also feature high throughput and low utilization of the processor in the PC, so that the server isn't dragged down by the network communications activity.

■ *Adaptec Inc., Milpitas, CA; 800-934-2766; www.adaptec.com.*

The Vision

THE SKY IS THE LIMIT

A U S T I N B U I L D S C O N F I D E N C E

Global Community: Austin Takes You Around the World

Our commitment to quality and innovation is world-class. Because Austin is a division of IPC Technologies, one call to Austin Computer, taps you into the many benefits of a diversified global organization with interests in notebook PCs, desktop systems, and departmental servers. As your company's computing, communications, or networking needs expand and evolve, you can rely on Austin's global perspective – and 14 years of experience – to deliver an integrated computing solution.



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Austin projects eye-catching confidence with a comprehensive product line that includes **high-end notebooks, reliable desktop systems, and bullet-proof departmental servers.** We invite closer scrutiny, because all Austin systems are configured for performance and priced for value. And each machine is backed by superior service and support.

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We're certain that our personal attention and higher level of craftsmanship will make the difference for your business today. And, as you grow, you can continue to depend on Austin. Our performance is proven in the PC industry — we've won the **5-Star Service Award** from *PC Computing* and the **Industry Information Technology Award** from *Government Computer News*. Call now and put Austin's commitment to work for you. **Seeing is Believing.**



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- **Austin Edge™ Series Notebook Systems:** Featuring the Austin Edge Duel™ with an 11.3" TFT 800x600 color display, Intel's 430MX™ PCI Set and the multimedia Docking Station with retractable stereo speakers and 10Base-T ethernet support.
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- **Austin Affinity™ Departmental Servers:** Quad Pentium Pro processors with 12 hot-swap drive bays and enhanced cooling for mission-critical reliability.

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Austin Edge Duet Standard Features

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256K Pipeline Burst L2 Cache
System Soft 1MB Flash BIOS
11.3" TFT 800 x 600 Color Display
32-Bit PCI Windows Video Accelerator
16-Bit Stereo Business Audio, Built-in
Microphone, Speaker & External Line-In/Out
Lithium-Ion Battery
Internal 3.5" Diskette Drive
(Mountable in Docking Station)
Integrated Glide Point® Mouse
Base Unit Weight w/ Battery: 4.7 lbs.

Portable Docking Station:

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Optional Internal 3.5" Diskette Drive
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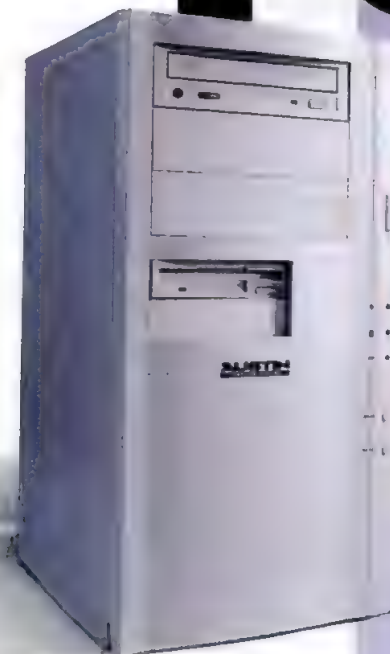
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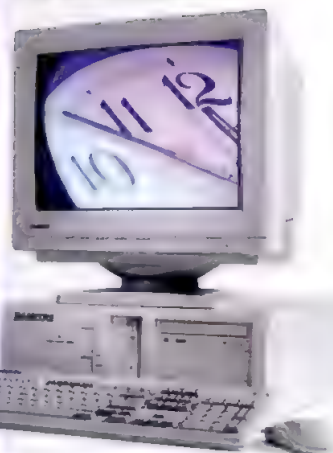


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200 MHz Intel Pentium Pro Processor with integrated 256K L2 Cache
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— PC Magazine, October 22, 1996

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ONLINE

Winner: The PointCast Network

Chris Hassett and the PointCast Team

THE INTERNET CAN provide an unbelievable wealth of information, but until recently you had to find and retrieve it yourself. By locating and delivering the information you want automatically, The PointCast Network inaugurates a new relationship between Internet content and the information consumer.

PointCast's broadcast-style delivery resembles TV or radio as it provides focused "channels" of information on particular topics. But unlike TV, it gives you fine-grained control over what is delivered as well as how and when you choose to browse it.

The PointCast client software, downloadable from the Internet, lets you select from a variety of channels, including news, company information, indus-

tries, sports, lifestyles, and weather. In each, you can set up multiple subtopics covering subjects of interest to you. The PointCast Network regularly delivers updated reports and images, which you can browse interactively. While your system is idling, its graphical screen-saver mode displays hyper-link headlines from your selected

topics, effectively turning your PC into an information terminal. On the back end, The PointCast Network packages multiple information services and news feeds for delivery to its estimated 1 million users. The recent introduction of the PointCast I-Server lets corporations broadcast internal information to employees while providing a high-performance proxy server for standard PointCast content.

With its broadcast-style information delivery, channel metaphor, and customizable topics, The PointCast Network is changing the face of information delivery. We expect to see other services quickly adopt this model, but PointCast was the pioneer.

■ *The PointCast Network Inc., Cupertino, CA; 408-253-0894; www.pointcast.com.*



Finalist: Firefly Technology

Max Metral, Upendra Shardanand, Yezdi Lashkari, David Ritter

WHILE MOST AGENT TECHNOLOGIES REMAIN ON THE drawing board, Firefly Networks' collaborative filtering put the agent concept into practice in a strikingly successful way.

Firefly agents help consumers locate goods and services by offering highly targeted recommendations. You create a Firefly agent by supplying information on your preferences and then refine it by offering feedback on its suggestions. Firefly can also compare your agent's selections with those of thousands of other agents and point you toward choices made by people with similar tastes. Firefly's current showcase on the Web (www.firefly.com) offers personalized music and movie recommendations that can be eerily accurate. (Softbank, the parent company of *PC Magazine* and Ziff-Davis Publishing, is an investor in Firefly Networks.)

■ *Firefly Networks Inc., Cambridge, MA; 617-234-5400; www.firefly.net.*

Finalist: Shockwave

Sarah Allen, Harry Chesley, Ken Day, Bruce Hunt, Chris Walcott

THE WEB CAME ALIVE THIS YEAR, AND MUCH OF THE credit goes to Macromedia's Shockwave. One of the first plug-ins for Netscape Navigator, it has remained one of the most influential. Pages that used to be static suddenly exploded with sound, colorful animation, video, and, most importantly, interactive elements.

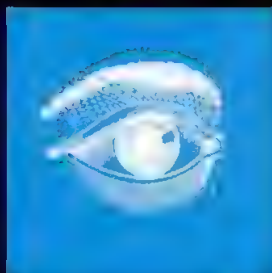
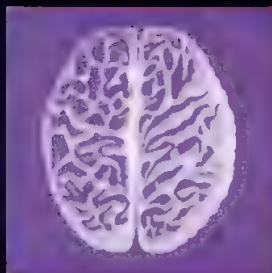
The technology has two parts. An encoder, called Afterburner, compresses ("shocks") files created in Macromedia's multimedia authoring tool, Director. On the Web client, Shockwave downloads shocked Director files, decompresses them on the fly, and plays them back seamlessly inside the Navigator browser as an integral part of a Web page. (Shockwave is also available as an ActiveX control.) Many of the most compelling Web sites today got that way through Shockwave, the tool that helped us see the Web as a dynamic medium for multimedia content.

■ *Macromedia Inc., San Francisco, CA; 800-470-7211; www.macromedia.com.*

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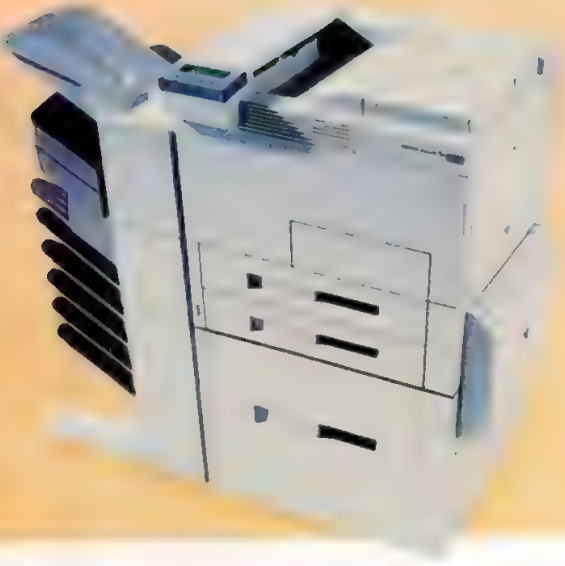
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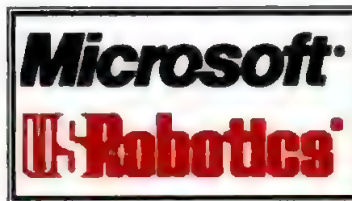
Winner: Point-to-Point Tunneling Protocol

Bill Verthein, Tom Stoner, Tim Mortsolf, and the PPTP Development Team



ALTHOUGH CONNECTIONS to the Internet are widely available, most companies have avoided using them to link remote locations and offices because of security concerns. The Point-to-Point Tunneling Protocol (PPTP), jointly developed by Microsoft and U.S. Robotics, is a new protocol specification that enables secure remote access to corporate networks across the public Internet. It lets you create virtual private networks over the Internet without the expense of dedicated lines, and lets remote users securely connect to a private intranet using any Internet service provider. In effect, PPTP makes the Internet a part of your intranet, and with excellent security. PPTP accepts RSA RC-4-encrypted data in the tunneled packets, and it supports DES encryption.

Once connected, you can use a number of network protocols, including IP, IPX, and NetBEUI, to connect to resources on the LAN. Datagrams from these protocols are buried inside higher-level IP packets for transmission. Since its introduction this spring, PPTP has been integrated into Microsoft Windows NT Server 4.0 and Mi-



crosoft NT's Remote Access Service (RAS), as well as U.S. Robotics' Total Control Enterprise Hub.

The PPTP specification builds on standards such as PPP and TCP/IP. For remote access across any kind of connection,

PPTP creates a "tunnel" directly to the appropriate departmental Windows NT server on a network—even if there are hundreds of Windows NT servers. By terminating the remote user's PPP connection at the Windows NT server, rather than at the remote-access hardware, PPTP allows network administrators to standardize network security using the existing services and capabilities that are built into the Windows NT security domain. Using PPTP, network administrators can extend a virtual private network from their Windows NT server throughout the Internet while locking out unauthorized users.

■ *Microsoft Corp., Redmond, WA; 800-426-9400; www.microsoft.com. U.S. Robotics, Skokie IL; 800-877-2677; www.usr.com.*

Finalist: Lotus Notes 4 and Lotus Domino

The Lotus Notes 4 and Lotus Domino Development Team

LOTUS NOTES HAS ALWAYS BEEN A UNIQUE PRODUCT, and Release 4 adds new features that make it even more powerful and easier to use. The most important innovation is Lotus Domino, a free, downloadable add-on that lets you quickly make a Notes database accessible by any Web browser. The result is a strong integration of groupware with the Internet/intranet.

In addition to making databases available to any browser-equipped PC and eliminating client software hassles, the Notes/Domino combination is also a very impressive collaborative Web-site creation tool. Leveraging the workflow features of Notes, users can pass documents through an organization for review and approval. Once approved, the documents are immediately available on the Web server.

■ *Lotus Development Corp., Cambridge MA; 800-346-1305; www.lotus.com.*

Finalist: Microsoft Windows NT Server 4.0

The Microsoft Windows NT Server Team

MICROSOFT WINDOWS NT, WHICH RECEIVED A *PC Magazine* Award for Technical Excellence in 1994, has always contained advanced network features. Windows NT Server 4.0 now adds significant enhancements to that solid base to make the operating system more flexible and easier to administer.

NT Server 4.0 includes important new enhancements, such as the Point-to-Point Tunneling Protocol and the unique Remote Access Server multilink channel aggregation, which lets you add together the bandwidth of several standalone connections to provide a cost-effective way of increasing throughput when you really need it. Other innovations include a built-in Web server and new Internet server APIs, a DNS server, and client and gateway services for NetWare, so that it more closely emulates a NetWare server.

■ *Microsoft Corp., Redmond, WA; 800-426-9400; www.microsoft.com.*



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Micron Electronics offers another excellent choice this Christmas. In fact, the **Micron Millennium™ P166** recently won the prestigious **PC Magazine Editors' Choice®**. The Millennium features 512KB pipeline cache and now comes standard equipped with a **64-bit video card boasting a huge 4MB of EDO RAM** with MPEG and 3D support. That means you'll have all the speed and power to run your favorite games and applications with optimum performance. And believe it or not, we've doubled memory while keeping prices competitive, making the Millennium an outstanding, value-packed system.

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— Family PC, May 1996

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"The Micron Millennium P166 offers the best combination of price, performance and features among the high end machines..."

— PC Magazine, June 1996

PERIPHERAL HARDWARE

Winner: Digital Light Processing

Larry J. Hornbeck, Ed Nelson, Jeff Sampsel, Richard Knipe



IF YOU'VE EVER USED AN LCD projector to display an image from your computer on a screen, you know that the images produced just aren't as crisp or clear as you'd like them to be. Digital Light Processing (DLP), an ingenious new optical technology from Texas Instruments, offers a substantial improvement.

Instead of using transmissive technology (blocking different parts of a light source to create the image), DLP uses tiny mirrors to reflect light, yielding an image bright enough to be seen clearly in a normally lit room. The mirrors are part of a Digital Micromirror Device (DMD), a special microchip covered with tiny, square aluminum reflectors that pivot. When a particular mirror element is tilted toward the display's

optical system, the pixel appears on; otherwise, it's off.

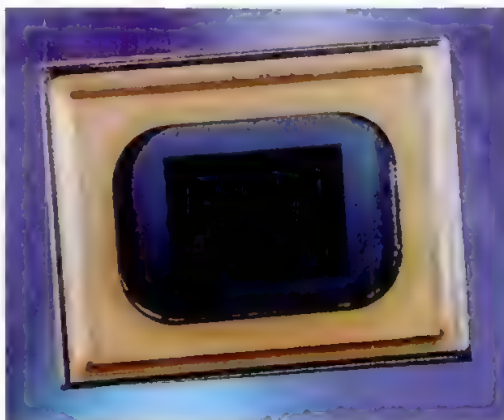
Most DLP projection units rely on a single-panel design in which a spinning color wheel provides sequential red, green, and blue light for the projector. Because each pixel is handled by a single mirror, you won't experience the convergence problems typical of conventional three-panel projectors. Because the mirrors cover virtually the entire chip surface, you'll also

see a cleaner image, without the annoying black outline often seen with active-matrix LCDs. Higher-end units with three panels are also available.

The first DLP projectors we've seen—from companies like In-Focus, nView, and Proxima—are expensive but produce dramatically sharper and clearer images than previous projectors. DLP projectors come in two flavors, VGA and SVGA, with SVGA micromirror chips using more mirrors and delivering a brighter image because of their larger surfaces.

In the near future, we expect DLP technology to have a major impact on all sorts of displays. For now, we can make glowing presentations without having to turn off the lights.

■ Texas Instruments Inc., Dallas, TX; 888-357-2984; www.ti.com/dlp.



Finalist: Iomega Jaz Drive

The Iomega Jaz Development Team

AS WE FACE EVER-LARGER APPLICATIONS, OVERSTUFFED databases, and vast stores of graphics files, our appetite for disk space is more ravenous than ever. Today's hard disks have largely kept pace with our needs, but when you have to back up a large drive or carry large files from one system to another, you need the Iomega Jaz Drive, the first mass-market removable storage solution to cross the 1GB mark.

Effectively, you can think of a Jaz Drive as a removable hard disk. The Jaz disk spins at 5,400 rpm, and its 12-ms average seek time and average sustained transfer rate of 5.5 MBps stack up well against conventional hard disks. An on-board 256K buffer further boosts performance. The mechanism itself is relatively inexpensive, with a street price of about \$500 for an external version and \$400 for an internal version. You can purchase individual 1GB cartridges

for as little as \$100; at 10 cents per megabyte, that's much less expensive than hard disk storage.

The drive and cartridges are designed for durability. The media cartridges are rated to survive a 3-foot drop, a 3g shock when operating, and up to an 80g nonoperational shock. Cartridges come with a lifetime warranty. The result is a system that lends itself to portable personal backup on today's large-capacity systems, as well as to transporting large files.

Other removable mass-storage systems have offered more capacity, but they've been mainly intended for corporate tasks such as network backup. By combining portability with capacity at a reasonable price, the Jaz Drive brings high-end removable storage to the rest of us.

■ Iomega Corp., Roy, UT; 800-697-8833; www.iomega.com.

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...With Just One Telephone Line, One Modem And Just One IP Address!**

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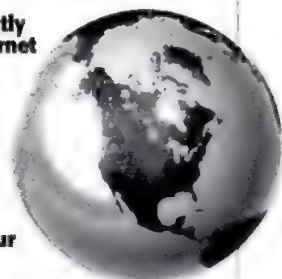


Connects Three PCs and one
external modem. Supports
individual E-Mail addresses
on one IP address.

1 Connect
WebShare To
Your Modem...

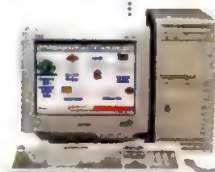
2 ...And Instantly
Provide Internet
Access...

3
...To THREE
Users In Your
Home Or
Office!



Requires Just 1
Phone Line, 1
Modem And
One IP Address!
Complete,
Ready To Use
Kit!

**INTRODUCTORY
SPECIAL**



Finally, there's an inexpensive way to connect up to three computers (PCs or Macs) to the Internet—simultaneously—using just one modem and phone line! A breakthrough for small businesses, schools and home computers—enabling all three users to maintain individual e-mail addresses and simple serial port connections. WebShare enables you to share the wealth of information available on the Internet with your associates and is fully compatible with popular Internet Browsers.

Easy To Install?...Takes Just Seconds!

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Compatible. Reliable. Smart...

You'll dramatically slash the cost of providing your organization with the Internet *advantage*. WebShare is fully compatible with Netscape Navigator, Microsoft Explorer, Eudora and other browsers. *Share the wealth...*

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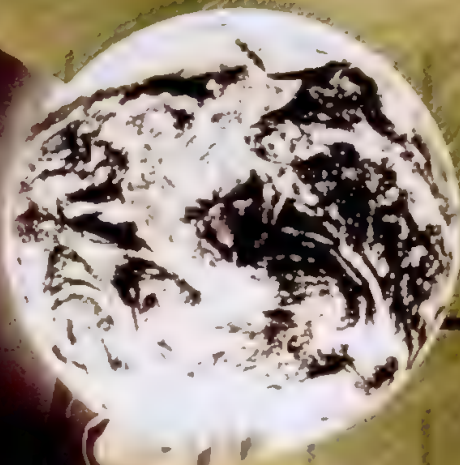
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DEVELOPMENT TOOLS

Winner: BoundsChecker 4.0 Professional

Ed Sullivan and the NuMega BoundsChecker Development Team

BOUNDSCHECKER 4.0 Professional Edition for Windows NT is a crowning achievement from a company long known for its powerhouse debugging tools. BoundsChecker's arsenal of bug-seeking weapons gives programmers a fighting chance at tracking down subtle language errors, memory leaks, Windows-resource leaks, and invalid Windows API calls.

BoundsChecker is tightly integrated into the Microsoft Visual C++ IDE and can unobtrusively monitor your program as you work, flagging errors automatically and pinpointing the offending sections of your code. By fitting transparently into the programming process, it encourages you to fix errors as they occur rather than waiting until problems have wors-

ened. BoundsChecker monitors all calls to the Windows API (including memory-allocation calls) and to supporting DLLs and OLE components, letting it uncover a huge array of Windows-related errors. It also helps you address subtle but maddening differences between the Windows 95 and

Windows NT APIs. Its impressive Compile-time Instrumentation (CTI) mode inserts testing code into a special test build of your Visual C++ program, letting CTI validate individual pointer and array accesses that are independent of Windows.

In the complex world of C++ Windows programming, where application frameworks can bloat the simplest applications to multi-megabyte proportions, programmers can't get by with the debugging tools of yesteryear. More than any other error-detecting tool available today, BoundsChecker helps you find and squash even the most well-hidden bugs, yielding more robust programs for all of us.

■ **NuMega Technologies Inc.**, Nashua, NH; 800-468-6342, www.numega.com.



Finalist: Java WorkShop

Larry Weber, Joe Keller, Steven Nathan, and the Java Workshop Development Team

MANY NEW JAVA DEVELOPMENT TOOLS WERE RELEASED this year, but none as radical as Sun's Java WorkShop. Truly a product of the Internet age, it takes the stance that a Java tool should itself be based on Internet technology and standards.

Java WorkShop is actually written in Java and runs in the Java virtual machine. The IDE where you write, compile, and debug your code is written in a mix of Java and HTML and is hosted inside an enhanced version of Sun's Hot Java browser. From project management to debugging, Java WorkShop has a very browserlike look and feel, with Forward and Back buttons and hyperlink navigation throughout. This approach won't be to every developer's taste, but it is instantly comprehensible to anyone who has surfed the Web. It also establishes a standard for the rich functionality, handsome look, and true platform independence you can create with Java.

■ **Sun Microsystems Inc.**, Mountain View, CA; 800-786-7638; www.sun.com.

Finalist: VRML 2.0 specification

Chris Marrin, Rikk Carey, Gavin Bell, Paul Strauss, Jim Kent, and the VRML 2.0 Development Team

INTERACTIVE 3-D VIRTUAL WORLDS SOUND SO MUCH more interesting than 2-D images, but up to now, virtual reality on the Web has faltered. The recently ratified VRML (Virtual Reality Modeling Language) 2.0 specification, based on Silicon Graphics' Moving Worlds proposal (and officially known as ISO/IEC 14772), changes the picture totally. Finally, a VRML standard exists with the power and features to make virtual reality fly. VRML 2.0 is all about motion and world dynamics. New constructs such as node event fields, routes, sensors, interpolators, and script nodes let VRML worlds become far more active and lifelike. Other innovations provide gradient and text-mapped backgrounds, sounds tied to locations in the world, and even video mapped onto objects. For applications ranging from data visualization to interactive games, VRML 2.0 is a real step forward.

■ **Silicon Graphics Inc.**, Mountain View, CA; 415-960-1980; vrml.sgi.com.



8:30 A.M. **MARKETING**
REQUESTS WEB SITE
FOR NEW **PRODUCT**
LINE. (GULP).



9:05 A.M. **18 PRODUCT**
DESCRIPTIONS, SWEEP-
STAKES ENTRY **FORM,**
CUSTOMER/PROSPECT SURVEYS.
ALL DUE NOW. **NATURALLY.**



10:20 A.M. **PHONE RINGS**
AGAIN. CUSTOMERS SHOULD
BE ABLE TO VIEW **ALL**
PRODUCTS. PROSPECTS,
ONLY **NEW PRODUCTS.**
...Riiiiight...



11:58 A.M. **Seems too**
EASY. MUST BE DOING
SOMETHING WRONG.
PHONE RINGS AGAIN.
CAN YOU SET UP A
DISCUSSION FORUM, TOO?



12:03 P.M. **FRIENDS**
ASK if YOU **HAVE time**
FOR LUNCH. TO YOUR
SURPRISE, YOU SAY YES.



1:29 P.M. YOU **ACTUALLY**
HAVE time TO ADD
COOL ANIMATION.
DROP IN **JAVA APPLET.**



2:40 P.M. **CONTENT still**
NEEDS to GO THROUGH
APPROVAL CYCLE.
SKEPTICISM SETS in
BIG TIME.



4:45 P.M. **It's UP.**
It's *RUNNING.*
Disbelieving CO-WORKERS
STAND in AWE.



5:40 P.M. **Leave**
WORK ON TIME.
FEELING GUILTY.
***TERRIBLY* GUILTY.**

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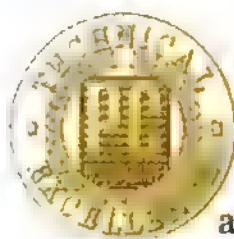
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TECHNICAL EXCELLENCE

AFTER HOURS

Winner: Quake

John Carmack and the id Software Development Team



THREE YEARS AGO, ID Software made headlines with its high-adrenaline DOOM, but the company's new Quake takes the experience of hunting monsters through threatening, claustrophobic rooms to an entirely new plane.

Quake is the first game of its kind to offer true 3-D graphics: You can move and look anywhere in what feels like a completely immersive graphical environment. The rooms and buildings that make up the seven episodes in Quake show a phenomenal level of detail, thanks in part to highly realistic texture mapping. The lighting effects are also vivid, especially the real-time lightsourcing that, for example, lets you see a trail

of fire following shots down a dark corridor.

The game is pretty straightforward: It's kill or be killed as sinister multipolygonal bad guys chase you around. You need to collect awesome weapons, deadly ammo, and thick armor as you fight your way to the exit. But even jaded gamers will find the grotesque monsters terrifying as they charge right at

you. More important, Quake is perhaps the best of the new crop of multiplayer games for use over a network or the Internet. You can play Quake with up to 16 people—even over a dial-up connection, as it makes impressively efficient use of limited bandwidth. Several players can cooperate to finish a level or fight it out in a match to the death.

Quake vividly illustrates how advances in graphics have led to compelling new kinds of gaming experiences. With its 3-D engine delivering real-time rendering of textures and true light-source effects, Quake sets a gory new standard for 3-D shoot-'em-ups.

■ *id Software, Mesquite, TX; 800-434-2637; www.idsoftware.com/.*



Finalist: NHL 97

Chip Lange, Don Transeth, Eric Peterson, David Pierce, Kurt Kennett, Funky Swadling, Tedd Striebel, Hanno Lemke, Sam Nelson, Jay MacDonald, Ken Sayler, Lance Wall, Victoria Wong, Phil Chow

LIKE MANY OF TODAY'S TOP SPORTS GAMES, NHL 97 employs high-resolution graphics and motion-captured player animations to re-create the look and feel of a real game. But 3-D polygonal players and ultrarealistically rendered 3-D ice rinks take this hockey simulation a big step further. Electronic Arts also includes digitized pictures of almost every NHL player, along with the customized art from most NHL goalie masks. Those faces are then mapped to the heads of the players, helping to create one of the most realistic sports simulations around. Electronic Arts has also built in a high level of machine intelligence, so that the computer-controlled players respond and

Finalist: Wing Commander IV

Chris Roberts, Anthony Morone, and Frank Roan

IF YOU'RE INTRIGUED THAT ONE RESULT OF ADVANCES in computer gaming is the equivalent of interactive movies, look no further than Wing Commander IV: The Price of Freedom to see this development in action. Crammed onto six CD-ROMs, this game integrates video better than any other game on the market. In fact, it uses 35-mm film, not video, to deliver a highly professional look. Most of it runs as full-motion, live-action video—displayed on ORIGIN's own movie player, which does a marvelous job of streaming the film. Wing Commander IV also fluidly integrates the video with more conventional SVGA game play for rendering and action sequences, making you feel that this really is a movie you control. Many ven-

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PERSONS OF THE YEAR

Marc Andreessen, Jim Barksdale



IF THIS WAS THE YEAR OF the browser, much of the credit goes to the vision of Marc Andreessen (right). As a student working at the National Center for Supercomputing Applications at the University of Illinois at Champaign-Urbana in 1993, Andreessen, with Eric Bina, created the first Web browser, Mosaic. In 1994, Andreessen and Jim Clark, a founder of Silicon Graphics, formed the company that became Netscape Communications. From the beginning Andreessen,

now Netscape's vice president of technology, saw Navigator not just as a browser, but as a revolutionary multimedia and applications platform. His vision changed the face of the Web and propelled Navigator into the commanding leadership position it still holds.

Much of the credit for Netscape's success as a business goes to its CEO, James L. Barksdale (left), who joined the com-

pany in 1995. Describing himself as the "adult supervision" at Netscape, Barksdale is no stranger to technology or corporate needs. He was chief information officer and later chief operating officer at Federal Express before becoming president and CEO of McCaw Cellular.

Netscape's constant improvements to its browser and its focus on corporate applications have drawn competition like a lightning rod. But they've also inspired the most rapid pace of innovation we've ever seen in software. The industry and millions of Web users owe a clear debt to the company built by these two men.



LIFETIME ACHIEVEMENT

Ted Hoff, Federico Faggin, Stan Mazor, and Masatoshi Shima



TWENTY-FIVE YEARS ago, a team of engineers at Intel, then a small Silicon Valley start-up, were confronted with an interesting challenge. A Japanese company called Busicom asked the firm to develop 12 separate components for an electronic adding machine. Intel's Ted Hoff instead proposed a ground-breaking alternative: a single integrated component that could handle multiple tasks.

Federico Faggin, along with Intel's Stan Mazor and Busicom's Masatoshi Shima (not pictured),

took Hoff's architecture and created the actual component. The result was a single chip that, when connected to two memory chips, met all of Busicom's specifications. But it could do a lot more. In fact, it could be programmed to perform just about any computational task.

This component, the 4004, was

the first general-purpose "computer on a chip," or microprocessor. It contained 2,300 transistors, ran at 108 kilohertz, implemented 45 8-bit instructions, and operated on a 4-bit data bus, enough to accommodate a single-decimal digit.

As simple as it now seems, that chip literally changed the world, paving the way for the entire modern computer industry and millions of smart devices. Microprocessors continue to grow in power, speed, and complexity, but it was with Mazor, Faggin, Hoff (left to right), and Shima that the digital revolution began.

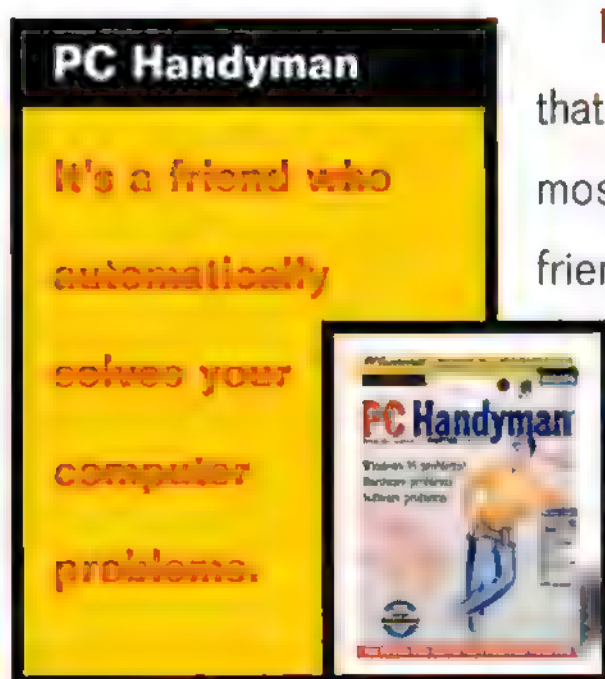


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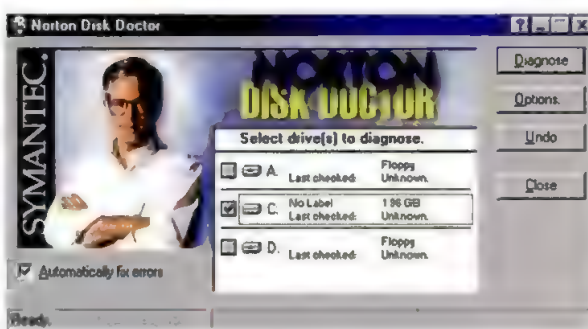


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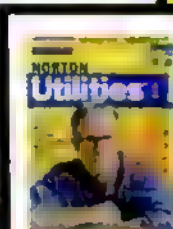


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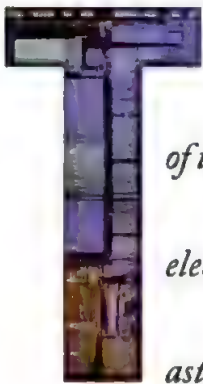
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25
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This year marks the 25th anniversary of the commercial launch of the first true microprocessor, built by Intel engineers for an early electronic adding machine. Since then, we've seen steady and astronomical increases in microprocessor power and complexity.

Here are some of the key moments in that 25-year history.

MILESTONES OF A

1971 Intel 4004

Designed by Intel's Ted Hoff, Stan Mazor, and Federico Faggin, along with Busicom's Masatoshi Shima, the Intel 4004 was the world's first general-purpose microprocessor. It consisted of only 2,300 transistors in a 4-bit architecture, supported 45 instructions, and ran at under 1 MHz. Laughably underpowered by today's standards, this seminal chip literally changed the world.



2,300 TRANSISTORS

1972 Intel 8008

The 8008, which had 3,500 transistors, was the first 8-bit microprocessor. Eight-bit data allowed the 8008 to manage alphanumeric data.



3,500 TRANSISTORS

1974 Intel 8080

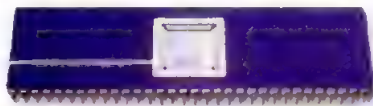
Intel introduced the 8080, a 2-MHz, 6,000-transistor microprocessor with 16-bit addressing that was eventually to become the heart of the MITS Altair, the first microcomputer. A small software start-up, Micro Soft, was launched by Bill Gates and Paul Allen, who wrote a BASIC interpreter for the Altair system as the company's first project.



6,000 TRANSISTORS

1974 Motorola 6800

The Motorola 6800, with 4,000 transistors, was designed by Chuck Peddle and Charlie Melear. It was mainly used in automotive controls and small-business machines.



4,000 TRANSISTORS

1975 Zilog Z80

The Z80, designed by Faggin and Shima, was seen as an improved version of the 8080. An 8-bit, 8,500-transistor processor with 16-bit addressing that ran at 2.5 MHz, it hosted CP/M, the first standard microprocessor operating system. The Z80 was the choice of many pioneer system vendors including Osborne and Kaypro, and, in many ways, brought PCs into business.

8,500 TRANSISTORS

1976 MOS Technologies 6502

MOS Technologies introduces the 6502, an 8-bit processor with very few registers and a 16-bit address bus, developed by Peddle and colleagues. It sold for around \$25 in the mid-seventies, a price that appealed to Steve Wozniak for his Apple II design.

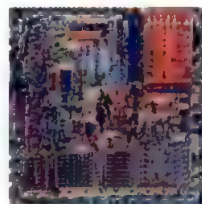


The 6502 launched the notion of personal computing in the public imagination and was used in several other popular PCs, including the Commodore PET, the Commodore 64, and the early Atari machines. Essentially an enhanced Motorola 6800, it made graphics effects easier to program and faster to execute, setting the computer gaming phenomenon in motion.

APPROXIMATELY 9,000 TRANSISTORS

1978 Intel 8086

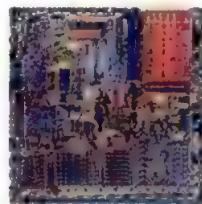
The 8086 was a 16-bit chip with 29,000 transistors. It introduced the x86 instruction set that's still present on x86-compatible chips today. Its segmented memory addressing was quite ingenious, but it ultimately proved to be a millstone that hung around the industry's neck for years.



29,000 TRANSISTORS

1979 Intel 8088

Intel's 8088 was based on the earlier 8086. Like the earlier processor, the 8088 had a 16-bit internal architecture, but it communicated with other components through an 8-bit bus. IBM chose this cost-saving design for its first PC, the direct ancestor of today's dominant personal computing platform. This was the chip that



would launch DOS, Lotus 1-2-3, and other groundbreaking software.

29,000 TRANSISTORS

1979 Motorola 68000

Motorola's 68000, with a new 32-bit instruction set, was the platform for some of the early Unix systems. More important, Apple chose it to implement the Lisa and later the Macintosh, the system that featured the first commercially successful graphical user interface.



68,000 TRANSISTORS

QUARTER-CENTURY

1982 Intel 286

Intel introduces its 286, the first x86 processor to support general protection and virtual memory. Used in the IBM PC AT (whose 16-bit AT extension-bus design is still in use for slower peripherals), the 286 ran at speeds of 8 to 12 MHz and delivered up to six times the power of the 8086. The 286 could support up to 16MB of physical memory.

134,000 TRANSISTORS



1987 Sun SPARC

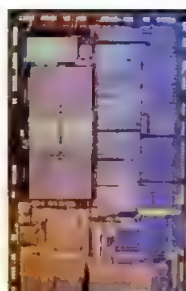
Sun introduces its first SPARC microprocessor. This chip and its offspring defined several generations of RISC-based workstations.

50,000 TRANSISTORS

1989 Intel 486

Intel ships its 486 processor, an enhanced 386 design. Its more than 1 million transistors included a built-in floating-point unit and 8K of internal RAM cache.

1.2 MILLION TRANSISTORS



1985 Intel 386

The 386 was a pivotal chip that enabled the transition to the modern era of personal computing.



This 32-bit design—with over a quarter of a million transistors and a 4GB address space—was the first mainstream Intel

chip to support linear addressing. It was on this platform that graphical operating environments, such as MS Windows and OS/2, began to seem workable. And it was with this chip that we stopped thinking about IBM compatibility and started to focus on the processor and operating system as the true platform.

275,000 TRANSISTORS



1986 MIPS R2000

MIPS ships its R2000, the first commercial RISC microprocessor.

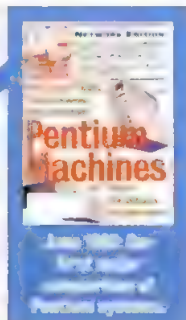
185,000 TRANSISTORS

1993 Intel Pentium

Intel ships its Pentium, incorporating a superscalar architecture whose dual-pipeline design could execute two instructions at once. With dual-integer units and a single FPU, and running at relatively high speeds, this chip (with its 3.1 million transistors) forms the basis for today's mass-market computer industry. It became the platform of choice for running Windows 95 and a host of PC applications, while at the same time bringing x86-based servers into direct competition with non-Intel machines.



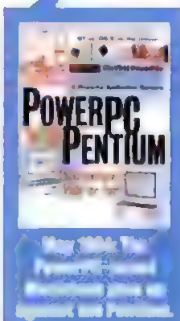
3.1 MILLION TRANSISTORS



1993 IBM/Motorola PowerPC 601

IBM and Motorola's PowerPC 601 brought RISC technology to mass-market computers. It was one of the first microprocessors to implement out-of-order execution of instructions. This processor and its successors have been adopted by Apple for its Power Macintosh line.

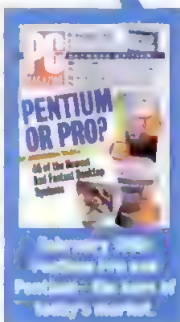
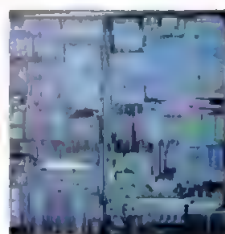
2.9 MILLION TRANSISTORS



1995 Intel Pentium Pro

The Pentium Pro is the most powerful Intel processor in production today. It uses an aggressively superscalar design that can execute up to three instructions simultaneously. The core CPU, with 5.5 million transistors, is paired with a second chip containing a Level 2 cache. Mounted in a single package, these dies are connected by an ultra-high-speed bus. The Pentium Pro debuted at the high end of the Intel-based server market but has since found its way into high-end and even mainstream workstations.

5.5 MILLION TRANSISTORS



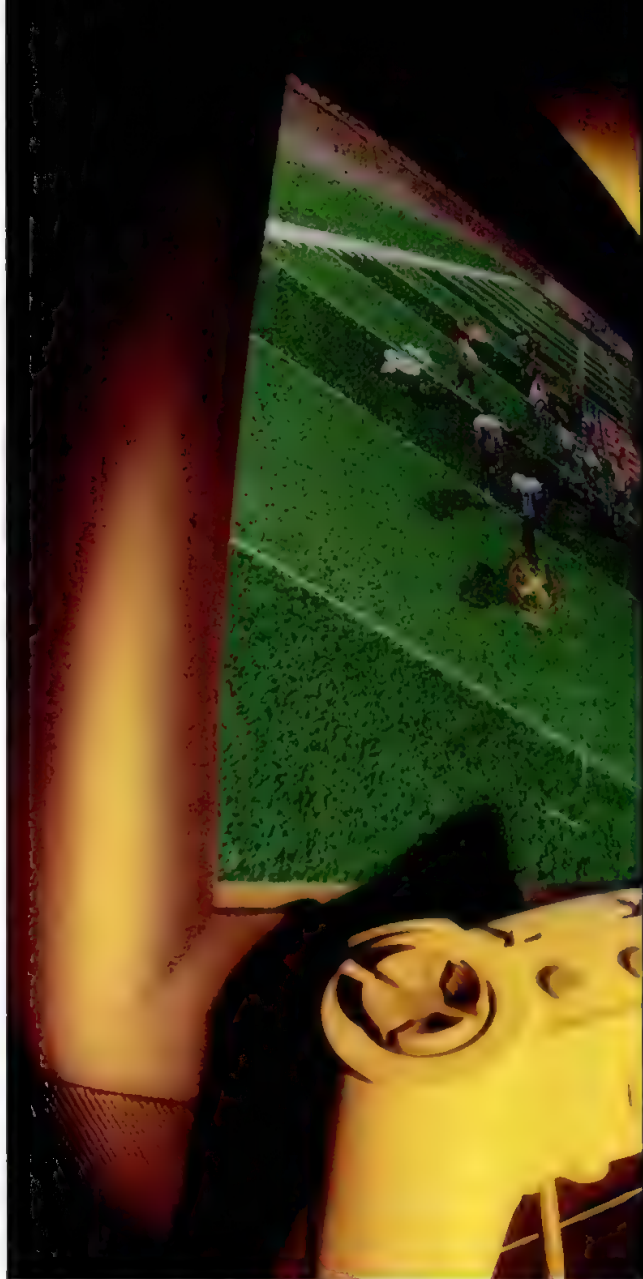
HIGH STYLE, HIGH SPEED

Home PCs are more exciting than ever this holiday season. PC Labs tests 18 midrange and high-end systems from the top vendors.

By Bill Howard

If you're searching for a home PC this holiday season, there's good news and bad news. The good news is that home PCs are the best they've ever been: easy to set up, fast, affordable, loaded with software, and brimming with new features. Now for the bad news: If you take a long-term view of things, you'd have to say that the home PC market is still maturing. In another five years we'll recognize 1996 as the year we advanced from the Model T era of home computing to the Model A era. In other words: Home PCs today are great, but what we have now is only just a beginning.

Consider, for instance, the system unit itself. Many of the 18 PCs we reviewed have rounded designs and funky case colors, including violet, purple, charcoal gray, jet black, and emerald. (Not all on the same system, fortunately.) Neat, huh? A sign of progress? Maybe. Now walk around behind the system and you'll see the same jumble of cables we've always had: at least 6 cables (power, monitor signal and power, keyboard, mouse, and modem), and



possibly as many as 14 on a typical home PC (add left and right speakers, speaker power, subwoofer, microphone, joystick, printer, and telephone set). True, many of the cables are color-coded for easy setup, but that's still a lot of cables. Maybe in a few more years we'll have system units so small—notebook PC-size—that they can be integrated into the monitor bases.

Or consider the telephony features on virtually all systems: speakerphone, answering machine, fax, possibly Internet telephone, and even receive-only videoconferencing (you can make it two-way by adding a \$100 to \$250 camera). Only with this iteration of home PCs do we finally have some models that alert you via a blinking light on a status panel if you have phone messages waiting. (In other words, exactly what you'd expect from any \$49 standalone answering machine.) The others make you bring the system up from sleep mode to check for messages. And only now do we have a model with a built-in telephone handset so you can have private conversations—no more attaching a standalone telephone.

IN THIS REVIEW

Acer America Corp.	157	Packard Bell	199
Compaq Computer Corp.	163	Sony Electronics Inc.	203
Gateway 2000 Inc.	174	Toshiba America Information	
Hewlett-Packard Co.	177	Systems Inc.	206
IBM Consumer Division	188	Editors' Choice	153
Micron Electronics Inc.	192	Performance Tests	170
NEC Computer Systems	197	Summary of Features	180



Overall, however, you'll be happy with how much computing power you can take home for about \$2,000 to \$4,000. And one computer from a vendor brand-new to the desktop PC market—Toshiba—will thrill you with the progress that's possible when you start with a clean sheet of paper.

REVIEW CRITERIA

In the previous issue, we reviewed Pentium and Pentium Pro PCs designed for business users ("Choose Your 200," December 3, 1996). Here we test the newest and hottest home PCs. Unlike most of our roundups, this was an invitation-only event. We sought out the top vendors of PCs designed for the home market. We also invited two newcomers who just began selling systems this fall and who could well make a big splash: Sony and Toshiba.

We asked vendors to send us a high-end system and a midrange system, meaning in most cases systems built around 200-MHz and 166-MHz

Pentium CPUs, respectively. We asked for 32MB of RAM and a hard disk capacity of at least 1.6GB for the high-end systems, and 16MB RAM and a 1GB hard disk size for the midrange systems. Vendors could submit 15-inch or 17-inch monitors, and any bells-and-whistles features that set their systems apart.

This filter netted us 18 systems from 10 vendors, including almost every PC vendor with at least a 2 percent share of the home market, with three exceptions: Apple, the number-two vendor (we review the Apple Performa 6400/200 in a sidebar); AST, whose Advantage! machine was submitted for our review but was unable to run our benchmark tests; and Dell, which claims not to be in the home PC business, but which is a good choice for repeat buyers.



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WHAT IS A HOME PC?

Compaq and Packard Bell pioneered the home PC market; Compaq in mid-1993 with its Presario brand that was distinct from its Deskpro and ProLinea

business PCs, and Packard Bell by devoting its entire energies to selling to consumers rather than businesses.

When you buy a home PC, you should expect to find

- easy setup and a great out-of-box experience (OOBE), including a colorful setup poster and color-coded cables;
- multimedia support, meaning a CD-ROM drive, a sound adapter, and speakers;
- a data/fax modem—possibly one that also functions as a speakerphone and answering machine;
- free software titles covering personal productivity, personal finance, and entertainment—anywhere from 10 to more than 40 titles; and
- technical support that's available evenings and weekends, which is when you're most likely to be setting up the system.

That's the bare-minimum definition of a home PC. The units we tested met the definition and then some. That's because the machines we got into PC Labs are more typical of better-quality home

RECENT REVIEWS

Choose Your 200

December 3, 1996.....page 100
40 Pentium Pro/200 and 51
Pentium/200-class PCs.

Power to the People

September 24, 1996.....page 147
45 Pentium Pro PCs running Win-
dows NT 3.51.

Portable Property

August 1996.....page 100
58 Pentium-class portables.

PCs than of entry-level home PCs. You can spend as little as \$2,000 for a pretty decent home system; you'll also see some systems selling for \$1,500 with features sets that would have been breathtaking 12 to 18 months ago but now are trailing-edge. We think you'll get more benefit with an investment of \$3,000 to \$3,500: a faster CPU, more memory,

faster and better 3-D graphics, faster CD-ROM drives, bigger hard disks, and a bigger monitor (typically 17 inches rather than 15). Spending that extra \$1,000 may extend the life of your PC one extra year. By that we mean extending its *practical* life—how long you can use it before it feels painfully slow—rather than the physical life of your system, which will be five years or more.

HEAT BELLS AND WHISTLES

Vendors have found it's hard to differentiate themselves on software bundles or performance, although they do try. Instead, this fall we saw a goodly variety of accessory hardware features as differentiators. Compaq offers a Visioneer-designed scanner keyboard. HP offers a snapshot photo scanner. NEC and Packard Bell have 100MB Iomega Zip drives. Several vendors offer DSVD modems, TV tuners, and remote controls. The TV tuners are finally beginning to deliver acceptable images. Packard Bell sent a golf ball-shaped video-conferencing camera and a personal scanner, though the vendor offers neither as a standard feature with any of its home PCs.

About half the vendors customize their monitors' front panels to work with their PCs. Both Compaq machines here have a great big volume knob on the front of their monitors; Toshiba also offers a big volume knob, but it's situated on the monitor's removable InTouch control module. (Other vendors have press-and-hold buttons that adjust the volume, but they don't work as quickly as the knobs do.)

Several monitors feature built-in microphones as well as built-in speakers. Built-in speakers reduce desktop clutter, but many of them just don't deliver great sound. Three-dimensional "surround sound" has become popular as a method of enhancing sound to give you the impression of being in a larger room and/or of hearing the sound from multiple sources. But our informal group of sound testers had mixed reactions: Some of the 3-D sound distorted music, although it did jazz up special effects for games.

Many of the PCs have "sleep" rather than "off" buttons, which work much the same way as your TV. The unit draws minimal power (about 5 watts) when it's in the sleep state, but it's ready to come back to life to receive a fax or answer the

HOME PCs

How to Read the Ratings Boxes

Suitability to Task

We rated each of the systems in four categories important to home users.

The **setup** rating indicates how much setup assistance is provided for users.

Excellent systems have setup posters, tutorials, color-coded cables, labeled ports, and Windows front ends.

The **edutainment** rating indicates how well the unit suits educational and entertainment needs. We consider multimedia performance, software, and accessories.

The **productivity** rating reflects how well a system meets business and communications needs. Key factors include bundled office suites, communications hardware and software, and system performance (speed).

The **sound** ratings, a scale of 1 to 5 stars (where 5 is best), reflect the quality of the PC's sound subsystem, as rated by an informal panel of *PC Magazine* staff members.

Service & Reliability

We include ratings for vendors that received at least

50 responses on our latest Service and Reliability poll of 17,000 subscribers. These results reflect readers' experience with desktop PCs from a given vendor. We analyzed the data using a *t*-test, a

standard procedure for identifying differences from the average that are significant at the 95 percent confidence level. For details, see our July 1996 issue.

The **reliability** rating is a measure of respondents' satisfaction with the reliability of the vendor's desktops in use over the past two years.

The **repair** rating is a measure of respondents' satisfaction with the repair service provided by the vendor for PCs in use over the past two years.

The **technical support** rating is a measure of respondents' satisfaction with the vendor's support for machines in use over the past two years.

The **percent needing repair** rating is a measure of the proportion of desktops that the respondents indicated needed repair during the past year. "Better than average" means that the incidence of needed repairs is significantly lower than average.

SUITABILITY TO TASK

Product Name

Setup	Excellent
Edutainment	Good
Productivity	Fair
Sound	★★★★

SERVICE & RELIABILITY

Company Name

Reliability	Better than average
Repairs	Average
Technical support	Average
% needing repair	Worse than average

Editors' Choice

- High-end system: Toshiba Infinia 7200
- Midrange system: Acer Aspire Personal Solution



If you're shopping for a new home PC this holiday season, you'd be hard-pressed not to find one that fits your needs and budget among this fine group of 18 systems. We were quite impressed with this crop, and rightly so, for they represent the best that the top vendors

have to offer. Among them, however, we found two that stand above the crowd.

Our first Editors' Choice is the \$3,550 Toshiba Infinia 7200 from Toshiba America Information Systems. The Infinia marks Toshiba's entry into the home PC market, and it's absolutely stunning in all respects. This machine is not just a high-powered, 200-MHz Pentium PC: It's a triumphant integration of leading-edge features, including a cable-ready TV tuner, a radio tuner, and SRS 3-D audio, all of which can be controlled either via remote, or by a monitor-mounted LCD panel. If you want more than just a PC, the Infinia is the system for you. This machine was also a recipient of *PC Magazine's* 1996 Award for Technical Excellence.

Our second Editors' Choice is the \$2,100 Acer Aspire Personal Solution from Acer America. If you're a first-time buyer looking for an affordable and easy-to-use PC, this attractive charcoal gray system is a great choice. The Aspire—which runs on an IBM 6x86-P166+ CPU—has something for every member of the family, from its monitor-mounted telephone with 33.6-Kbps modem for Mom and Dad to its extensive software bundle with its many kid-oriented titles. Add Acer's one-click Internet solution (which includes 5 hours per month of free Internet access for one year) and you have a well-rounded, affordable package. (Although the Aspire was a competent performer, we suggest one of our honorable mentions if your needs demand top per-

formance: the Gateway P5-166 FPC.)

We also found two systems here worthy of honorable mentions. If you're looking for a great gaming machine, check out the \$4,050 Compaq Presario 8712. Not only will its audio system knock your socks off, but its superior 3-D graphics will certainly catch your eye.

The Gateway P5-166 FPC is the machine to look at if you're in the market for a performance-oriented system and can live without some of the family-oriented accoutrements. Gateway loads up the box with great features including a 2.4GB hard disk, an 8X CD-ROM drive, and its Generations II software bundle.



phone in only a few seconds. All of these systems do have ways to turn the power all the way off, if that's your preference.

BYE-BYE, FRONT END

When we tested home PCs last holiday season, Windows 95 had just come out, and about a third of them had *software front ends* that shielded less-skilled users from the complexities of Windows 3.x—even though it was no longer being installed on home PCs—and from the possibility that Windows 95 might still be too complex. Microsoft's Bob, released earlier in 1995, convinced most vendors that they needed a front end, either Bob or one of their own. Bob turned out to be a monumental flop and many users have found Windows 95 easy enough to use that they don't need a front end. Still, if you want a front end, you can get it on 11

of the machines we tested, including Acer, Compaq, Hewlett-Packard, NEC, Packard Bell, and Sony. If you want to wring the last bit of performance from your PC, turn off the front end; it steals some of your PC's computing power.

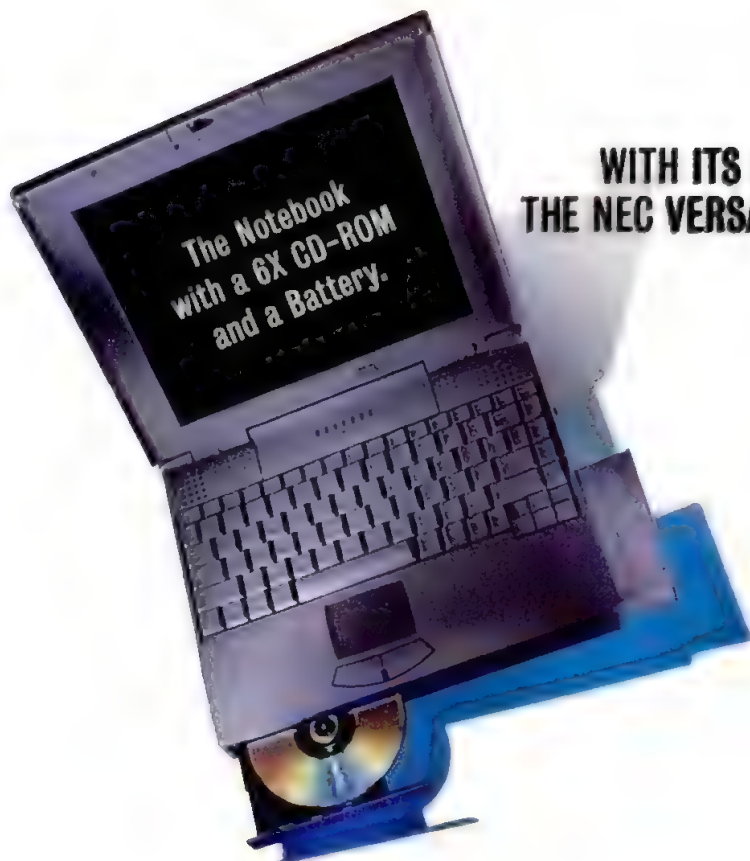
WHAT WE FOUND

Of the 18 home PCs we reviewed, the hands-down winner was the Toshiba Infinia 7200. It's the one we'd like in our own homes as well as one we'd happily recommend to friends and relatives. Best of all was the removable InTouch control module that plugs into the system's USB port

and sits below the monitor. This module controls with a single press of a button all the entertainment and telephony functions of the Infinia: CD, radio, TV, speakerphone, and answering machine. The Infinia is one of the machines here that actually tells you if you have phone messages waiting by way of an LCD, without making you power up the machine to find out. It's our Editors' Choice for the high-end category, and it's also a winner of our 1996 Award for Technical Excellence.

We were impressed by the makeover at Packard Bell. This is the vendor that PC buffs have historically loved to hate

Our Contributors: BILL HOWARD is an executive editor of *PC Magazine*. CADE METZ is a staff writer, and BRUCE BROWN is a contributing editor of *PC Magazine*. MARY E. BEHR and ANUSH YEGYAZARIAN are staff editors, and ROBERT DALY is an editorial researcher at *PC Magazine*. CAROL VENEZIA was the associate editor in charge of this story, and RICHARD FISCO was the project leader.



WITH ITS INTERCHANGEABLE COMPONENTS, THE NEC VERSA 2400 IS ACTUALLY 4 NOTEBOOKS IN 1.

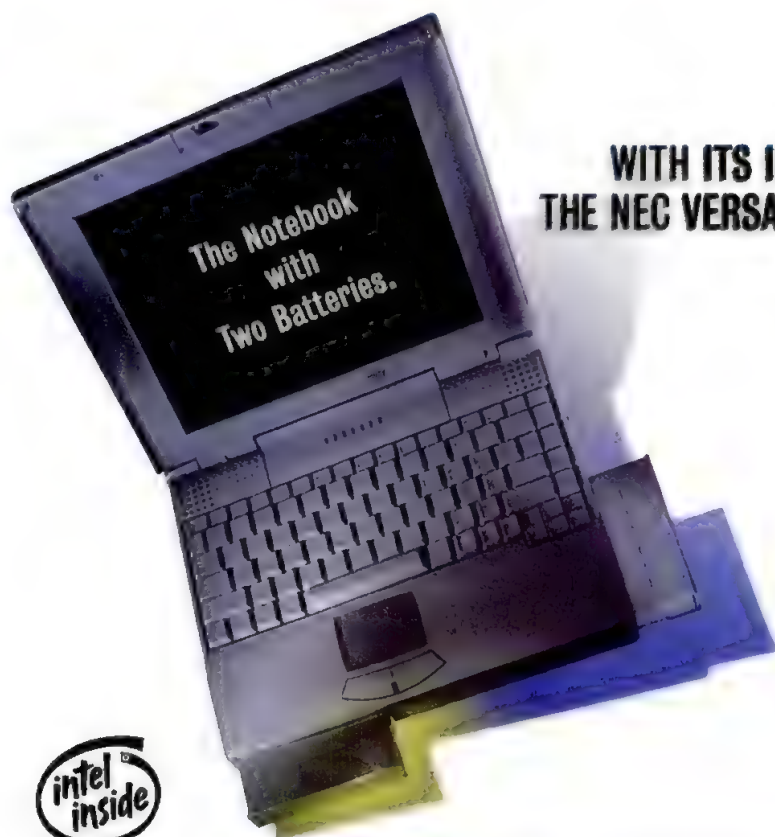
Just slip the 6X CD-ROM drive and battery into the two modular VersaBay™ slots, and your NEC Versa® 2400 changes into a state-of-the-art multimedia tool for brilliant on-the-road presentations.

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starting at \$2199**

*Intel Pentium® Processor
up to 133MHz
Up to 16MB EDO DRAM
Up to 1.08GB hard drive
11.3" DSTN color display
Two VersaBay slots**
Two high-output
stereo speakers
Two PC Card slots
MPEG video*

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Just insert both batteries† into the two modular VersaBay slots, and your NEC Versa 2400 becomes a notebook with enough juice for up to 6 hours of nonstop computing.

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Up to 16MB EDO DRAM
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Pop the battery and the floppy drive into the two modular VersaBay slots, and your NEC Versa 2400 turns into a notebook that will effortlessly store and transfer data wherever you are.

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*Intel Pentium® Processor
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Up to 16MB EDO DRAM

Up to 1.08GB hard drive

11.3" DSTN color display

*Two VersaBay slots***

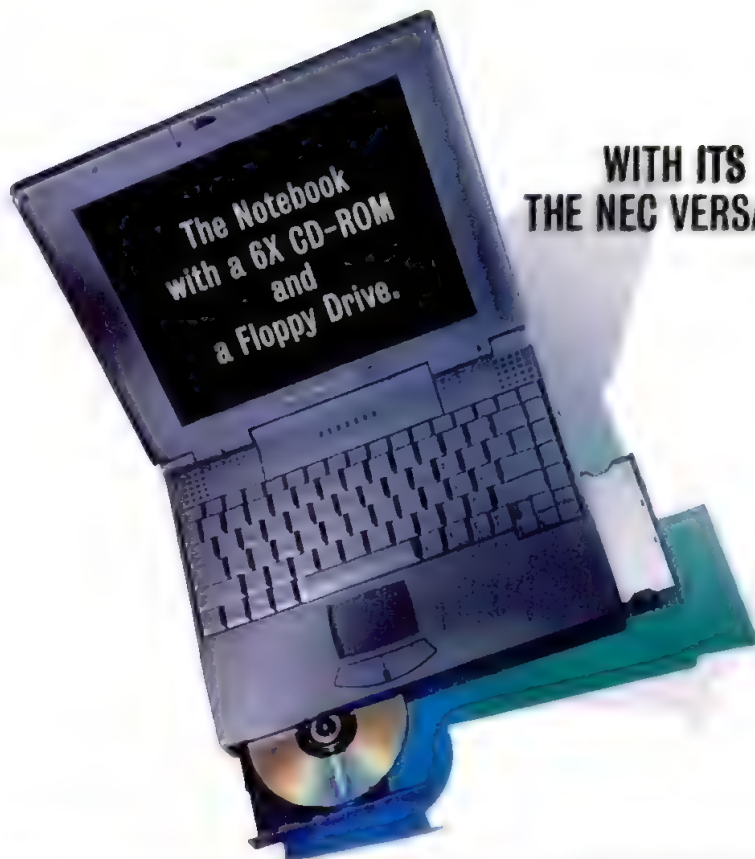
*Two high output
stereo speakers*

Two PC Card slots

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Slide the 6X CD-ROM drive and the floppy drive into the two modular VersaBay slots. On AC power, your NEC Versa 2400 transforms into a powerful multimedia notebook that will rival a desktop computer.

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Up to 1.08GB hard drive

11.3" DSTN color display

*Two VersaBay slots***

*Two high output
stereo speakers*

Two PC Card slots

MPEG video

SEE, HEAR AND FEEL THE DIFFERENCE.™

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CIRCLE 107 ON READER SERVICE CARD

for its mediocre construction and poor service and reliability ratings. The two units we tested were quite acceptable except for the sound. Ours were called Platinum systems, but Packard Bell also offers essentially similar PCs with different names to give nearby competing retailers some small measure of exclusivity.

IBM's Aptiva S78 (code-named "Stealth") pioneers a modular design in which the main system unit is tucked under the desk. It's connected by a cable to a small desktop console containing a CD-ROM drive, a floppy disk drive, and the power switch. This makes for a less cluttered desktop, albeit at a \$150 premium over an otherwise similarly configured Aptiva. The Aptiva S78 includes a wireless Logitech mouse, but the design team included it late in the process and lost the opportunity to integrate the required transceiver into the drive console and thereby decrease the cord-and-cable count. IBM promises to fix this next year.

We admired Gateway's gutsiness in sending an industrial-strength Pentium Pro 200-MHz system as its high-end home PC offering, and to no one's surprise, it was the top performer here on most of our benchmark tests. We still contend, however, that Pentium Pros work best with Windows NT rather than Windows 95.

We also received one system with IBM Microelectronics' version of the Cyrix 6x86-P166+ CPU, the Acer Aspire Personal Solution. In previous testing, we've found that if you outfit a Cyrix 6x86-based PC with components similar to a Pentium PC (hard disk, graphics board, and so forth), you'll get essentially the same performance. And that's exactly what we found with the Aspire in this roundup: Its test scores were very competitive. The Aspire's \$2,100 price makes it an even more attractive choice for first-time users, or for those on a budget, and it's our Editors' Choice in the midrange category.

SHOULD YOU WAIT FOR MMX?

It's no secret that PCs get faster and cheaper every few months, and we're resigned to the fact that they're going to depreciate quickly. But when it's our own money on the line—rather than our company's money—we want to make sure there's no quantum leap of technology just around the corner that would make us

Picks & Pans: Home PCs

A lot of ingenuity and innovation went into this crop of 18 home PCs. Below are just a few of the new features we liked most, with one exception. We saw everything from TV and radio tuners to SRS 3-D audio subsystems, add-in boards for enhanced 3-D graphics, and even voice-controlled PCs.



LOOKS GREAT BUT...

This subwoofer, which matches the Acer Ultimate Solution's case, looks appealing but distorts sound so much that you're better off without it.



FREE INTERNET With Acer's Aspire Personal Solution and Ultimate Solution, you get up to 5 hours per month of free Internet surfing for one year. Acer even includes Microsystems Software's filtering program, Cyber Patrol, so you don't have to worry that your kids will be surfing in dangerous waters.

kick ourselves for not waiting.

The biggest change on the horizon is the MMX version of Intel's Pentium processor. MMX, which informally stands for multimedia extensions, is due out in the first quarter of 1997, with first systems shipping then. The MMX processor was due out in the fourth quarter of 1996, but Intel ran into production snags. Intel claims performance improvements of 10 to 20 percent on current software compared to an otherwise similar Pentium system, and claims that the addition of MMX-enabled software will provide even better performance. Even if the performance equated to the low end of Intel's range, that could be something worth waiting for, especially since we expect the chip to carry only a

small price premium over a Pentium CPU. The MMX desktop line will include 166-MHz and 200-MHz chips, while MMX chips for notebook PCs will be available in 150-MHz and 166-MHz versions.

PC Labs obtained an early MMX system from Hewlett-Packard (sent by mistake, HP says). The Pavilion home system features a motherboard that accepts both Pentium MMX and Pentium Classic CPUs; ours had an MMX CPU aboard. (The two Pavilions we report on here use the Pentium Classic chip.) Our tests under current Windows applications and an early MMX-enabled program, Adobe PhotoDeluxe, found performance gains ranging from negligible to just over 20 percent. For more information on our tests and results, please



HELP IS ON THE WAY NEC's wise-cracking Merlin video avatar not only will help you out with Windows 95 when you need it but will make you laugh as well



NOW YOU SEE IT The Media Console of IBM's Aptiva S78—code-named "Stealth"—provides access to the CD-ROM drive, floppy disk drive, and power switch. The actual "PC" sits under your desk



FUTURE TECHNOLOGY, TODAY Toshiba's Infinia 7200 uses a Universal Serial Bus port to hook up its InTouch control module. It's the first USB port we've seen that actually works



IN CONTROL Audiophiles will love NEC's control panel! Compaq Presarios each have Easy Access Buttons for features that usually have to be accessed by software, plus a "message waiting" light

(digital shared voice and data) modems that let you and your PC communicate simultaneously over a single phone line.

You also should know that the free software you're getting is about to be a year out of date. Here's what happens: PC vendors lock in the software they bundle with their fall-edition home PCs in midsummer, netting you the 1996 editions. Consumer software vendors ship many of their updates—the 1997 editions—in the early or middle fall. So the PC you buy this fall will bundle 1996 software, while the same software titles you could buy by themselves in the same computer store will be the 1997 versions. PC vendors typically shift to the 1997 titles with their spring models, which come out around March.

see the Trends article "MMX Put to The Test" in our issue of November 19, 1996. For its part, Intel says forthcoming applications will do a better job of using the 57 new instructions embedded in the MMX CPU and users should see significant performance gains. But based on our tests, we didn't see the kind performance leap that would make us want to hold off.

Other upcoming and currently incomplete technologies you should know about include *universal serial bus*, or USB, that will let you attach dozens of peripherals to your PC without running out of I/O ports or interrupt (IRQ) lines. If you must have a PC this fall, a few vendors already offer USB; many will follow in the first half of 1997. There is yet no standard for *DSVD*

SPECIAL TESTING

As with all PC reviews, we ran our battery of benchmark tests to determine overall performance. We found that home PCs may be a tick or two slower than PCs not designed specifically for the home market, but it's not a big difference. We tested them with their front ends disabled because we think that's the way most *PC Magazine* readers would use the systems.

Additionally, we rated each PC on its out-of-box experience. Packard Bell and Toshiba fared best here, although even the products that we rated *fair* in this respect were pretty good. In fact, no vendor's system got a *poor* rating. We also judged the quality of the sound output of each system. Here, Compaq's high-end Presario 8712 fared best. Vendors receiving lower scores were the ones that integrated speakers into the monitor, although Sony and Toshiba have showed you can get good sound from built-in speakers. Sony has even built a subwoofer into the monitor base.

You should be happy with virtually any one of the 18 systems reviewed here. If you do buy, don't look back. But bear in mind that what's leading-edge today will be ho-hum tomorrow.

Acer America Corp.

Aspire Personal Solution, Aspire Ultimate Solution



After starting an industry trend with its aesthetic appeal, the Acer Aspire line now excels in the area of convenience. Both the Aspire Personal Solution (\$2,100 street) and the Aspire Ultimate Solution (\$3,300 street) offer elegant exteriors with integrated telephone and sleep features. But while both Aspires are good choices, the Personal Solution is an outstanding value for first-time family buyers, and it is our midrange Editors' Choice.

Each unit in the Aspire line has a distinctive, art-deco feel. It is subtly

SUITABILITY TO TASK

Aspire Personal Solution

Setup	Excellent
Entertainment	Good
Productivity	Good
Sound	**

Aspire Ultimate Solution

Setup	Excellent
Entertainment	Good
Productivity	Excellent
Sound	***

Price/Performance Index: Home PCs

This price/performance index goes to show that for the most part, the leading vendors provide very comparable levels of components and performance in their different classes of home PCs. If you examine the chart below by category (midrange versus high-end), you'll see that systems tended to cluster together within each category, with a few exceptions.

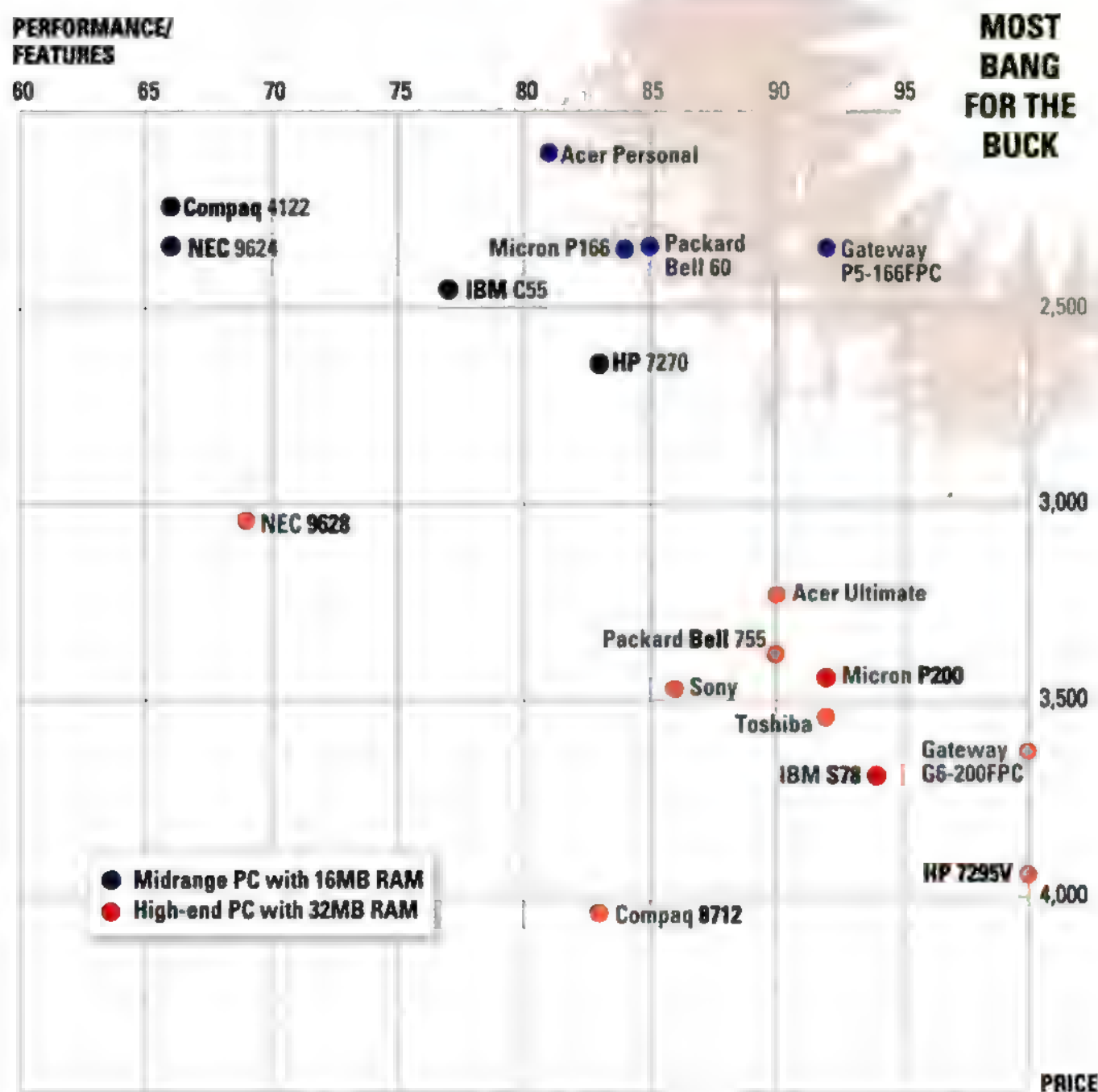
Leading the pack on the performance/features scale at both ends of the home PC spectrum are the two entries from Gateway 2000: the \$2,354 Pentium/166-based P5-166FPC and the \$3,637 Pentium Pro/200-powered G6-

200FPC. Both machines continue Gateway's tradition of providing fully loaded PCs for a price that won't break the bank. A great feature the two FPCs have in common is Gateway's Generations II software collection. Generations II provides titles for virtually all members of the family, from Microsoft's Money 4.0, Publisher, and Works 4.0 for parents to Microsoft's Entertainment Packs 1 through 4 (31 games) for kids of all ages.

THE DATA POINTS

Performance on our ZD Business Winstone 97 and CD-

ROM WinMark 97 tests counted for a total of 20 percent of the performance/features score. System components, including the formatted size of the installed hard disk, the size of the monitor (actual screen size measured along the display's diagonal), the amount of graphics memory installed (including additional 3-D accelerator board memory), and the speed of the installed modem, counted for an additional 17 percent. Warranty terms, including the availability of on-site service and 24-hour, 7-day toll-free technical support, accounted for about 10 percent. The remainder of the score reflected many other factors, including the number of free IRQs and the presence or absence of color-coded cables, labeled ports, setup posters, and custom Windows 95 front ends. You can find price/performance index data online either in the Hardware Library of the Editorial Forum on PC Mag-Net under 22BANG1.TXT, or on the World Wide Web at www.pcmag.com.



streamlined and toned charcoal gray (or emerald green) from chassis to mouse. The gray is complemented by a cool purple on the keyboard's palm-rest and four feet that support the main system. The Ultimate Solution also has a Logitech Sidewinder joystick, available in a matching color scheme.

Both models include monitors with integrated speakers—a 15-inch monitor for the Personal Solution and a 17-inch one for the Ultimate Solution. The Ultimate Solution

offers a cylindrical subwoofer (a \$49 option that's included in the price). If your sound requirements call for good bass, however, we suggest finding another subwoofer. This model produces a significant amount of distortion, even at low volume levels.

While many systems offer extensive telephony features, Acer's Aspire Solutions each come with a full-featured, aes-

thetically pleasing telephone attached to the side of the monitor. Another design plus is the new Quick Start feature. Lightly pressing the power button sends the unit into a minimal-power sleep mode; the system will still awaken if it receives a phone message, a fax, or Internet news. If you press and hold the button, the system will completely power down. Also, if

SERVICE & RELIABILITY

Acer

Reliability	Average
Repairs	Average
Technical support	Average
% needing repair	Average



you shut down Windows 95, the unit will power off on its own.

This kind of convenience is the rule with these Acer systems. Each model ships with an illustrated setup poster, color-coded cables, and a library of help manuals. New PC users can find solace with ACE (Acer Computer Explorer), a customizable front end that helps with software installation, organizes software into folders, and lists technical-support phone numbers.

The bundled software is plentiful: home-office packages (Microsoft Money, Microsoft Works, and Quicken SE), entertainment titles, a phone and fax center that works with both systems' 33.6-Kbps modems, and multimedia applications (including Verbex's voice-activation software, Listen for Windows).

The one-click Internet solution provides a year of free access (up to 5 hours per month) through Concentric Network. Netscape is preloaded, and you have the option of installing AOL and PointCast (the Internet filter CyberPatrol is also available on the Personal Solution). Although Acer's Quiet PC feature is supposed to deliver virtually silent operation, we didn't notice any reduction in overall white noise. In fact, the CD-ROM drives were noticeably loud.

The 200-MHz Ultimate Solution ships with 32MB of EDO RAM, a 3.3GB hard disk, and an integrated ATI 3D Rage II graphics chip set. The unit was a below-average performer with the exception of

an average CD-ROM WinMark 97 score.

We tested the Personal Solution with a smaller hard disk; unlike others here, it is built around an IBM 6x86-P166+ processor. It posted average scores on most benchmark tests within the midrange category.

These machines are beautiful—both in mien and functionality—and provide a bounty of useful features for the whole family.—Cade Metz

Aspire Personal Solution. Street price: \$2,100. **Aspire Ultimate Solution.** Street price: \$3,300. Acer America Corp., San Jose, CA; 800-558-2237, 408-432-6200; fax, 408-434-0556; www.acer.com/aac. Circle 441 on reader service card.

Compaq Computer Corp. Presario 4122, Presario 8712

What the Presario home PCs from Compaq Computer Corp. lack in panache, they make up for in affordability and practicality. While the Presario 4122 (\$2,250 street) targets the value-minded family, the Presario 8712 (\$4,050 street) is built for demanding users and those weaned on arcade games. The cases are not highly designed or vividly colored, but they offer an extensive and pragmatic set of external controls.

The 8712 has a top front panel with a set of Easy Access buttons for several features that normally are only software-accessible. One button

plays back answering-machine messages, while another sends the system into sleep mode. Four right-hand

buttons control the CD-ROM drive (play/pause, forward, back, and stop). Two left-hand

buttons link you to the Compaq Phone Center and the SmartQ Home Base. The Phone Center works with a 33.6-Kbps Compaq DSVD Talk and Send modem to provide speakerphone and answering-machine functions. The Home Base is a Windows front end linked to an extensive,

SUITABILITY TO TASK

Presario 4122

Setup	Good
Entertainment	Good
Productivity	Fair
Sound	★★

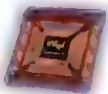
Presario 8712

Setup	Good
Entertainment	Good
Productivity	Good
Sound	★★★★



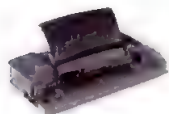
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- NiMH battery

SATELLITE PRO 430CDS*/430CDT

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- Two stacked PC Card slots (two Type II or one Type III)
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- Windows® 95 or Windows for Workgroups included
- 3-year limited warranty
- Toll-free technical support - 7 days a week, 24 hours a day

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©1996 Toshiba America Information Systems, Inc. All prices, specifications and availability are subject to change. †Price is for 200CDS model, price of 430CDS model begins at \$2499, price of 430CDT model begins at \$3399. *The 200CDS and 430CDS are sold at selected resellers as the 205CDS and 435CDS with Windows® 95 and additional pre-installed software. **10X average speed. All products indicated by trademark symbols are trademarked and/or registered by their respective companies. Intel Inside and Pentium Processor Logos are trademarks of Intel Corporation.

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graphical help database that is accessible via an icon on the Windows 95 toolbar or by pressing the Q Easy Access Button.

This model's Pentium/200 CPU is supported by 32MB of EDO RAM and 512K of L2 cache. It was an average performer on our benchmark tests. Standout features are a 3.6GB hard disk and a PowerVR 3D Arcade graphics card with 4MB of DRAM for 3-D games, which supplements the system's integrated S3 ViRGE chip set with 2MB of EDO memory.

A gaming machine, the 8712 also ships with a Thrustmaster joystick and gamepad. Sound is provided by a 16-bit

SERVICE & RELIABILITY	
Compaq	
Reliability	Better than average
Repairs	Better than average
Technical support	Better than average
% needing repair	Better than average

viewing area of which measures 15.8 inches along the diagonal. The 8712's sound system was the most impressive in this roundup: It produced clear, rich bass tones at both low and high volume levels.

The desktop 4122 has a smaller hard disk than the 8712 does, but it has the same Easy

audio card, two JBL Pro Premium self-powered speakers, and a subwoofer.

Volume is controlled by a large knob on the system's monitor, the

Access buttons and software suite. Because of its lack of L2 cache, this machine garnered significantly below-average test scores, including the roundup's lowest Business Winstone score. This PC also offers a 15-inch monitor and mountable speakers.

The Presario software bundle is healthy, although not as comprehensive as others in this roundup. The Compaq Multimedia Suite provides myriad players and recorders for both sound and video, while SurfWatch lets you filter Internet content. The machines ship with Microsoft Works, Intuit's Quicken SE, several gaming titles, and several online packages. By the end of

Apple's Performa 6400/200

By Robert Daly

No discussion of the home PC market would be complete without a mention of Apple Computer. The company has weathered some rocky times recently, but it is still a force to be reckoned with in the home.

This past August, Apple released its latest high-end multimedia machine, the Performa 6400/200 (list price \$2,678 with a 15-inch monitor). Based on a 200-MHz PowerPC 603e CPU with 16MB of RAM and a 2.4GB hard disk, the Performa is a powerful multimedia family system. Apple also offers the Power Macintosh series of performance desktops for business and education, based on the PowerPC 604 CPU.

FRIENDLY AS EVER

User-friendliness has always been a hallmark of Apple products. Getting the system out of the box and running can literally be done in under 5 minutes. The intuitive icons and the universal power cords make setup a breeze: Connect two serial cables and two power cords and you're done.

The face of the Performa mini-tower features an 8X CD-ROM drive, a 3.5-inch floppy disk drive, a headphone jack with volume control, and an infrared port (compatible only with other Apple devices). There is also a detachable front panel that allows easy access to internal components, such as the 28.8/14.4-Kbps fax modem,

After the initial boot-up, the Performa launches into a series of Multimedia tutorials that teach the user the fundamentals of using the mouse to drag and drop and navigating around the desktop. While it is helpful to have a live-action demonstration, the presentation's excessive perkiness may be a bit much for older audiences. Your 7-year-old will probably like it, however.

BOUNTIFUL SOFTWARE

The Performa also offers a well-rounded software bundle, including home-office, Internet, and edutainment titles. For adults, the system includes ClarisWorks, Quicken Special Edition, and Megaphone for Performa (phone/fax software). Another useful title included with the system is At Ease 3.0, which allows the system's owner to grant network-style access rights. Each user is given an account with a password and defined rights to

specific applications—no more worries that your 12-year-old will mess with your tax records or business files.

Internet surfers will like the Apple Internet Connection kit, which has all the software you need to take advantage of e-mail, newsgroups, and FTP and telnet sites. All users have to provide is a connection to an ISP of their choice. For parents who are not comfortable letting their kids have unrestricted Internet access, Apple bundles Spyglass's SurfWatch, a password-protected application that filters out explicit material. The product comes with a one-year maintenance plan that allows users to download monthly updates from the SurfWatch Web site.

There is a remarkable diversity of titles for younger members of the family. Thinking Things 2 and The Amazing Writing Machine will help kids get a leg up on the basics. Grolier's Multimedia Encyclopedia, 3D Atlas, and Our Times are good tools to help older kids with their homework. A copy of the 3-D game Descent is also bundled.

If you're looking for an easy-to-use, powerful multimedia machine that comes with loads of software for the entire family, the Performa 6400/200 is a good choice.

Performa 6400/200. List price: With 15-inch monitor, \$2,678. Apple Computer Inc., Cupertino, CA; 800-538-9696, 408-996-1010; fax, 408-996-0275; www.apple.com. Circle 451 on reader service card.



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BENCHMARK TESTS

Home PCs



Thanks to the variety of different CPUs used in these home PCs, we saw a wide range of performance. But from the now-lowly Pentium/133 up to a powerhouse Pentium Pro/200, all of these systems will meet the goal of running your home applications.

What the Numbers Mean

2D Business Winstone 97 As in the past, processors teamed with the most L2 cache, fastest-spinning hard disks, and best-optimized graphics cards posted top scores on our Winstone tests. Not surprisingly, our top Winstone performer was the Pentium Pro-based Gateway G6-200 FPC, whose score was 17 percent higher than that of the fastest Pentium/200 unit (the Micron Home MPC P200). At the opposite end of the Winstone scale was the Pentium/150-based Compaq Presario 4122, whose performance on our tests was hobbled mainly by its lack of L2 cache.

2D Graphics WinMark 97 Though several systems used graphics cards based on S3's ViRGE chip, it was Micron's two entries—the Micron P166 high-volume system and the Micron P200 power system—that got the most from that chip. Both Microns used Diamond Stealth 3D 2000 graphics boards, and they both managed to outperform the other S3 ViRGE-based implementations. Diamond's execution of the ViRGE chip set boosts performance in two areas. First, Diamond fully optimizes the card's drivers. Second, Diamond reengineers the board layout. By making wire traces as short as possible and impedance-matching signal lines, vendors can realize faster dot-clock speeds. PC Labs found that Diamond's board runs with a 70-MHz dot clock, while the chip is rated to run at just 50 MHz. Combine the extra work that Diamond puts into the board with the two Microns' 512K of L2 cache (which compares with their competitors' 256K) and you have top performance.

In this roundup we also saw the addition of 3-D accelerator cards, each working in conjunction with a graphics card. The HP Pavilion 7295V and the Micron P200 both used add-in cards based on the 3Dfx Interactive Voodoo graphics accelerator. These cards are aimed squarely at the gaming enthusiast. The boards support features such as texture modulation for smooth interpolation of colors across a polygon applied to a texture, perspective-correct texture mapping to reduce polygon counts, and subpixel correction to eliminate polygon and texture misalignment. The Voodoo chip supports Microsoft's Direct 3D, Criterion's Renderware, and Gemini Technology's OpenGVS.

The Compaq Presario 8712 uses the PowerVR Arcade 3D card developed jointly by NEC and VideoLogic. Another 3-D game accelerator and one that is similar to the Voodoo card, PowerVR supports perspective-correct texture mapping, exponential fogging, and multiple translucent textures and layers. The PowerVR card supports Microsoft's Direct 3D and PowerVR's graphics language SGL.

2D Disk WinMark 97 Unlike products in our recent business-PC roundup, these home PCs used only EIDE hard disks. EIDE is still the most popular drive interface, while SCSI drives tend to be noisier, more expensive, and somewhat more complicated to use. On the positive side, you do get somewhat better performance and expandability from SCSI drives. An EIDE drive typically spins at about 4,800 to 5,400 rpm, which compares with a SCSI drive's maximum spin rate of 7,200 rpm. Because of the increased spin rates, SCSI drives have lower latencies and faster data-transfer rates than EIDE devices.

The IBM Aptiva S78 and NEC Ready 9628 each used IBM's 5,400-rpm Deskstar 3 hard disk. This disk's average seek-to-read time is 9.5 ms. When you combine this with an average latency of 5.6 ms, the Deskstar 3 provides top-flight disk performance for Pentium-based PCs. The Deskstar 3 also uses a format known as *no-ID sector*. ID fields or headers are areas on a disk that store information identifying the data sector (among other pieces of information, including flags to indicate defective sectors). Unfortunately, as much as 10 percent of a track can be used for the ID field and thus cannot be used to store information. IBM's no-ID sector format uses the servo-control system to locate the data sectors and stores the defect map in RAM instead of on the disk itself. This frees up disk space and allows for a greater drive areal density.

On the other side of the coin is the Quantum Bigfoot drive used in the Compaq Presario 4122. The 3,600-rpm Bigfoot is designed for value-oriented PCs—not leading-edge performance systems. Its slow rotational speed showed on our Disk WinMark tests, where the Presario 4122 posted a score that was nearly 30 percent lower than the high-volume group's average.

2D CPUmark₉₇ Given the wide range of processors used in this roundup, it was clearly the speedier CPUs that performed well. Processors varied from a Pentium/133 to a Pentium/200, with a Pentium Pro/200 thrown in for good measure.

The best way to get the most performance out of the CPU/memory subsystem is to surround it with fast components. In this roundup, 3 of the 18 systems came with 512K of L2 cache, while 1 machine, the Compaq Presario 4122, came without L2 cache. The 2 Micron systems put their 512K of L2 cache to good use, posting top scores on the CPUmark tests within their categories. The Compaq Presario 8712 also had 512K of L2 cache, but its CPUmark score was more in line with the scores of the other Pentium/200s with only 256K cache. We believe that the Presario 8712's memory and cache timings are tuned more for compatibility than barn-burning performance.

Except for the two Acer entries, all systems here used Intel chip sets. The two Acer Aspires each used Acer Labs' Aladdin III (M1521 and M1523) core-logic chip set. The Aladdin III matches the Intel 430HX PCIs set's ratings of 5-2-2-2 EDO read timings at 66 MHz, and 3-1-1-1 L2 cache burst timing. Despite what the specifications say, however, the Aspires did not perform on a par with similar systems on our CPUmark tests. In fact, the Acer Aspire Ultimate Solution finished last among Pentium/200 entries (its score was actually a few points lower than that of the Pentium/166-based NEC Ready 9628).

2D CD-ROM WinMark 97 and Multimedia Tests We saw two different 12X CD-ROM drives in this roundup: the Mitsumi CRMC-FXZ120T and the Hitachi CDR-8130. It was the Mitsumi drive, however, that lived up to its speed rating on our Sequential

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BENCHMARK TESTS

16K Read test. This test performs sequential reads from the CD-ROM and should elicit a result that is very close to the manufacturer's throughput rating.

We saw mixed results on our High-Quality Action Cinepak test, which uses a 900-KBps clip and taxes both of the systems' graphics CD-ROM subsystems. Some systems handled the high throughput rate well, while others were unable to show more than a couple of frames in the clip (that is, their scores show a high number of dropped frames). In general, PCs with S3 ViRGE-based graphics boards best handled this clip. The ViRGE accelerator uses a technique that S3 calls *Streams Processor*, which provides the stretching and YUV color-space conversion features required for full-screen video playback from both software codecs and hardware MPEG-1 sources. Streams Processor allows simultaneous display of graphics and video of different color depths. For example, it is possible to display 24-bit-per-pixel-equivalent video on top of an 8-bit graphics background. This saves both memory bandwidth and storage capacity while permitting higher frame rates.—*Analysis written by Richard Fisco*

How We Tested

We tested all systems with 1GB or larger hard disks and 6X or faster CD-ROM drives. Systems in the mainstream (midrange) portion of this roundup had 16MB of RAM, while the high-end systems used

32MB. We used each vendor's preinstalled graphics driver for 1,024-by-768 resolution with 64K colors, small fonts, and a refresh rate of 75 Hz. We also disabled power management features and removed unnecessary drivers and disabled Windows 95 front ends. We defragmented hard disks before each test and let Windows 95 manage virtual memory settings.

We used our benchmark test program ZD Winstone 97, Version 1.0, to measure system performance when running 32-bit Windows 95 applications. Winstone 97 is divided into two categories: **ZD Business Winstone 97**, focusing on mainstream applications, and **ZD High-End Winstone 97**, which emphasizes CPU- and graphics-intensive applications. In this roundup, we ran only our Business Winstone tests, which measure the time a PC takes to execute a set of application scripts that exercise eight of the best-selling Windows 95 applications. Business Winstone weights a given PC's test timings based on the applications' unit market shares; it derives a composite number and converts it to a relative score. (The score is relative to the performance of a Gateway 486DX2/66 with 16MB of RAM, whose score is defined as 10.)

ZD WinBench 97, Version 1.0, is a measure of graphics, disk, processor, CD-ROM, and motion-video performance under Windows 95. Like our Winstone tests, ZD Graphics WinMark 97 and ZD Disk WinMark 97 are each divided into business and high-end sections. In this roundup, we ran only the business portion of these suites. The **ZD Business Graphics WinMark 97** score, a number based on a log

▲ Higher scores represent better performance.
▼ Lower scores represent better performance.
Bold type denotes first place within each category.

	ZD Business Winstone 97	ZD Business Graphics WinMark 97	ZD Business Disk WinMark 97	ZD CPUmark₃₂
	Score	Score	Thousands of bytes per second	Score
MIDRANGE PCs				
Acer Aspire Personal Solution (IBM 6x26-P166+)	24	27.2	418	284
Compaq Presario 4122 (P/150)	18	21.9	364	204
Gateway P5-160FPC (P/166)	32	42.3	584	300
HP Pavilion 7270 (P/166)	26	32.4	355	313
IBM Aptiva C55 (P/150)	24	26.6	416	286
Micron Home MPC P166 (P/166)	31	44.5	566	337
NEC Ready 9624 (P/133)	22	25.0	399	288
Packard Bell Platinum 60 (P/166)	27	33.4	529	306
HIGH-END PCs				
Acer Aspire Ultimate Solution (P/200)	29	30.9	478	312
Compaq Presario 8712 (P/200)	33	33.9	624	345
Gateway 86-200FPC (Pentium Pro/200)	47	57.2	713	549
HP Pavilion 7295V (P/200)	34	38.5	522	352
IBM Aptiva S78 (P/200)	32	29.9	715	351
Micron Home MPC P200 (P/200)	39	56.0	629	396
NEC Ready 9628 (P/166)	31	28.6	700	315
Packard Bell Platinum Pro 755 (P/200)	34	38.5	605	346
Sony PCV-90 (P/200)	32	29.6	606	357
Toshiba Infina 7200 (P/200)	32	31.2	627	351

BETTER ►

BETTER ►

BETTER ►

BETTER ►

* With an Action, Cinepak, 640-by-480, 30-fps, 900-KBps clip

of GDI operations used in the Business Winstone tests, represents the performance of each machine's graphics subsystem under Windows 95. Scores are normalized to reflect performance relative to the base system used for Business Winstone testing. The **ZD Business Disk WinMark 97** score, based on a log of disk functions used in the Business Winstone tests, represents the performance of each machine's disk subsystem under Windows 95. Results are reported in thousands of bytes per second and then converted to a harmonic mean weighted in the same way as the Business Winstone results.

The **ZD CPUmark** scores reflect the speed of a PC's processor subsystem—which includes the CPU, secondary cache, and system RAM—under 32-bit operating systems. The tests emulate the CPU activity of real-world applications.

The **ZD CD-ROM WinMark 97** tests gauge the performance of each machine's CD-ROM subsystem, which includes the CD-ROM drive, its adapter, and its required software drivers. The tests are based on a profile of six of today's most popular Windows CD-ROMs. We report the results of the **CD-ROM Sequential 16K Read** test, which measures the throughput of a CD-ROM subsystem as it reads 16K blocks of data on a CD-ROM. The **CD-ROM Access Time** score measures CD-ROM drive performance as it randomly accesses 2K blocks from the entire CD-ROM. The **CD-ROM CPU Utilization** score represents the percentage of the CPU's bandwidth occupied by servicing the CD-ROM subsystem as it retrieves data. To deter-

mine the utilization, WinBench 97 uses a default block size of 16K. The transfer rate defaults to the maximum rate of your particular CD-ROM subsystem. WinBench 97 then calculates this transfer rate before it runs the actual test.

WinBench 97 also includes a suite of video clips that measure a PC's ability to play full-motion AVI files. We test video-playback performance with different clips at a variety of data and frame rates, using the Cinepak codec. Here we report results from the High-Quality Action Cinepak test, which uses an Action, Cinepak, 640-by-480, 30-frame-per-second, 900-KBps video clip. For this test, we report **Frames Dropped** and **CPU Utilization**.

We also report the maximum frame rate and number of audio breaks for the high-quality clip. **Maximum Frame Rate** is the number of frames divided by the time it took to display every frame in the clip. The number of frames in the high-quality clip is 450. If it took a system 10 seconds to display all the frames, then the maximum frame rate is 45 fps. The **Audio Breaks** score is a measure of your PC's ability to play the video clip's audio portion without gaps in the sound. In the context of audio breaks, lower scores are better, because the fewer breaks in the audio, the better the subjective quality of the sound. All systems are set to their default settings to drop frames if behind in displaying clips. If a system has to break the audio stream during playback, this is a sign of a serious performance problem in the video and audio subsystems.

ZD CD-ROM WinMark 97

Thousands of bytes per second

CD-ROM

Sequential
16K Read
(Kbps) ▲

Access Time
(ms) ▼

CPU
Utilization ▼

High-Quality Action Cinepak*

Frames
Dropped ▼

CPU
Utilization ▼

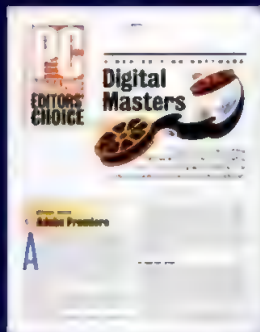
Maximum Frame
Rate (fps) ▲

Audio Breaks ▼

750	1,220	173	58%	435	97%	22.2	0
704	1,220	180	65%	376	94%	29.0	0
816	1,220	148	8%	20	95%	38.4	0
708	1,220	158	30%	27	97%	31.7	0
723	1,220	170	36%	163	95%	27.4	0
1,050	1,360	100	65%	42	96%	31.6	0
618	1,210	191	56%	439	92%	22.7	1
665	1,210	185	10%	19	95%	32.2	0
820	1,500	167	74%	468	97%	25.9	0
781	1,230	185	57%	332	97%	21.1	0
980	1,790	155	8%	0	96%	40.7	0
800	1,220	153	28%	0	97%	38.1	0
751	1,210	104	73%	435	97%	21.6	0
1,060	1,360	97	65%	18	97%	31.9	0
627	1,210	205	56%	433	92%	23.6	0
660	1,220	198	9%	10	96%	33.3	0
550	1,230	168	27%	283	96%	28.1	0
833	1,220	141	28%	71	97%	30.0	0

BETTER ►

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PCs

Home PCs

the year, each Presario will also ship with a free videophone software package.

Each PC has two USB ports and can be configured via a setup poster and color-coded cables. The warranties—one-year parts and labor, and 90 days on-site service—are shorter than some here, but the prices and external-access features will appeal to buyers.—*CM*

Presario 4122. Street price: \$2,250. **Presario 8712.** Street price: \$4,050. Compaq Computer Corp., Houston, TX; 800-345-1518; fax, 713-518-1442; www.compaq.com. Circle 442 on reader service card.

Gateway 2000 Inc.

Gateway P5-166FPC, Gateway G6-200FPC

The Gateway P5-166FPC (\$2,354 direct) and G6-200FPC (\$3,637 direct) are efficient home PCs, but either could double as a business machine. The G6-200FPC is even equipped with a 200-MHz Pentium Pro processor, which is more appropriate for use in Windows NT than in Windows 95. Nevertheless, these machines, especially the G6-200FPC, have leading-edge components and provide remarkable performance under Windows 95.

The P5-166FPC and the G6-200FPC each ship with Gateway's Generations II software collection, two Altec Lansing speakers, a sub-woofer, and a 28.8-Kbps fax modem. The Generations II bundle includes Bob, Cinemania, Encarta 96, Microsoft Works, Music

Central, and Publisher, as well as several games and edutainment disks.

The off-white G6-200FPC tower case has a total of 11 drive bays. Two of its front bays offer a 12X Mitsumi CD-ROM drive and a SCSI CD-recordable drive. The CD-R is supported by a bundled copy of the Corel CD Creator 2.

With a Pentium Pro CPU, the G6-200FPC consistently turned in this roundup's highest scores except on our CD-ROM WinMark 97 tests, where it was bested by Micron Electronics' Home MPCs. Like all the high-end systems, it came with 32MB of EDO DRAM; its strengths are a 3.6GB Quantum Fireball

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Gateway

Reliability	Better than average
Repairs	Better than average
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% needing repair	Average

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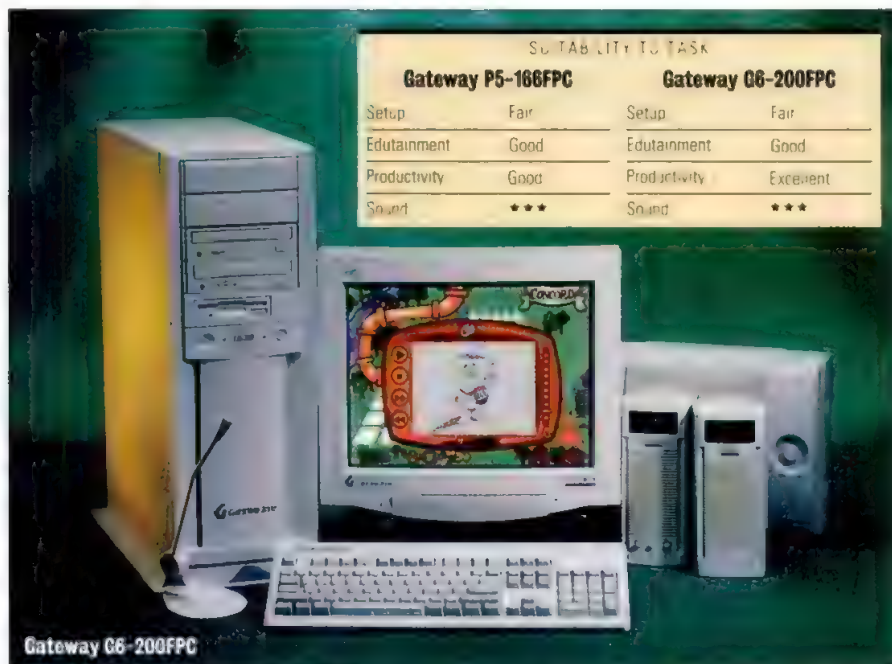
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Gateway P5-166FPC		Gateway G6-200FPC	
Setup	Fair	Setup	Fair
Edutainment	Good	Edutainment	Good
Productivity	Good	Productivity	Excellent
Sound	***	Sound	***

Gateway G6-200FPC

hard disk and a Matrox Millennium graphics card with 4MB of WRAM.

The P5-166FPC carries the same Matrox card as the G6-200FPC and thus scored particularly well during graphics testing. But it has a Pentium/166 chip, 16MB of memory, and an 8X Toshiba CD-ROM drive as well. Though its 2.4GB Western Digital hard disk was slower than the G6-200FPC's, it still managed to post an above-average disk score. The unit forgoes a CD recorder, and it trades a mini-tower for the G6-200FPC's spacious 11-bay case, but in every other respect this machine measures up to the more expensive Gateway entry.

A 17-inch monitor accompanies each PC, as does a standup microphone and a mouse pad. These systems are not *objets d'art* like many of today's home PCs, nor do they offer the usual array of deft accoutrements, but they are prime performers with hearty multimedia support.

Though Gateway's true home machines undoubtedly are its large-screen Destination PCs (see the sidebar "PC/TV: If You Can't Beat 'Em Join 'Em"), the units reviewed here appeal to home users demanding speed as well as value.—*CM*
Gateway P5-166FPC. Direct price: \$2,354.
Gateway G6-200FPC. Direct price: \$3,637. Gateway 2000 Inc., North Sioux City, SD; 800-846-2000; 605-232-2000; fax, 605-232-2023; www.gw2k.com. Circle 443 on reader service card.

Hewlett-Packard Co. HP Pavilion 7270, HP Pavilion 7295V

Hewlett-Packard Co.'s current Pavilion home PCs may not break new ground in design, but they embody the high standards and easy-to-use features of the original Pavilion. The HP Pavilion 7270 (\$2,650 street) is a fine basic system for home use, with a 166-MHz Pentium CPU and a 15-inch monitor. Packed with features for high-powered imaging, the Pentium/200-based HP Pavilion 7295V (\$3,950 street) will meet the needs of the most demanding gamers. There are other Pavilion models between the 7270 and the 7295V, but these two products demonstrate HP's keen understanding and accurate targeting of specific home PC markets.

The more exciting system of the two is the 7295V. Its 4MB 64-bit Orchid Technology Righteous 3D card with the 3Dfx Interactive Voodoo chip set provides knockout visual quality and speed for games. This setup is great for videoconferencing and imaging applications. Intel's ProShare is included for receiving those videoconferencing calls.

The 7295V also comes with Adobe's

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Hewlett-Packard	
Reliability	Better than average
Repairs	Better than average
Technical support	Better than average
% needing repair	Better than average



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application PhotoDeluxe as well as a host of entertainment and reference titles. The entertainment titles include VR Soccer 96 and Whiplash, a dynamite car-racing game that amply shows off what video memory can do with a hot 3-D board. If you have a gamer in the family, expect that you'll have to set time limits on PC use.

Both tested Pavilions come with HP's RealLife Imaging software and S3 ViRGE graphic adapters on-board (augmented with the above-mentioned pass-through Voodoo-based board on the 7295V). On our benchmark tests, the performance numbers for these machines were mostly average for their categories; however, they both produced below-average Business Disk WinMark 97 scores.

The 7270 comes with a 2.4GB hard disk, a 28.8/14.4-Kbps modem, and a 15-inch monitor. The 7295V jumps up to a 3.8GB hard disk, a 33.6/14.4-Kbps modem, and a 17-inch monitor. HP's Windows front end, Personal Page, organizes applications and user aids, but it runs slowly even on the faster 7295V.

Both Pavilions have Yamaha audio chips for Spatializer 3-D sound, but the monitor-integrated Altec Lansing speakers don't measure up to expectations. They are decent for gaming, but if you try to use them for home audio you'll find the sound distortion is bothersome.

The Pavilions offer great expansion

Price of tested configuration For PCs sold through resellers, assume that street prices will be 15 to 20 percent lower than list prices. When a company factors this discount into its quoted price, we indicate that the cited price is a street price. All street prices are rounded to the nearest \$10.

Installed RAM We requested 16MB of RAM for the midrange machines and 32MB of RAM for the high-end machines.

Hard disk interface EIDE denotes Enhanced IDE, an extension to IDE that supports higher disk capacities and faster transfer rates. Seagate's Fast ATA-2 and IBM's ATA-3 are specifications for increased transfer rates and larger capacities.

Screen diagonal claimed/measured In most cases, the vendor's claimed size of the monitor is larger than the actual viewing area.

Expansion-bus slots PCI cards may share a

backplane with ISA cards, meaning that you cannot use both simultaneously. These shared slots are listed as PCI/ISA.

Television board A television board is a PCI card with a tuner and an NTSC video converter that changes the TV signal into one that your VGA monitor can handle.

Integrated software refers to a software package that includes word processing, spreadsheet, and database programs all in one, such as Microsoft Works for Windows 95. Software suites, such as Corel Office Professional for Windows 95, are also included.

A Windows front end is a preinstalled program provided by the manufacturer that helps familiarize the user with the PC and its features.

Finance and reference list the software packages included in the bundle that fit into these two categories.

potential: Not only are there several free internal and external drive bays in each machine, there are several open expansion slots and two free IRQs, so adding a second hard disk or creating a home network is not only possible but hassle-free.

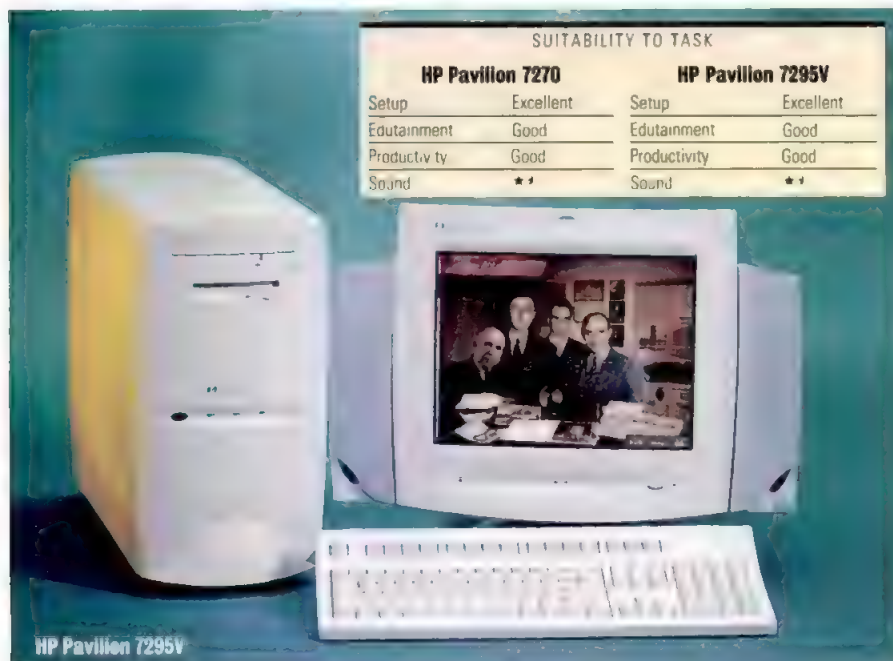
The design of the Pavilions, un-

changed since the line's inception, no longer stands out from the crowd. The slightly bulbous case with seams for indicator lights and reset key is pedestrian next to the Toshiba Infinia 7200 and IBM Aptiva S78 cases, although HP is ahead of those vendors that put the word *home* on the front of regular business PC cases.

HP still offers the hand-holding features that will appeal to the first-time home PC buyer: the color-coded cables, labeled ports, and easy-to-find 800 number. The box topper, a colorful poster that illustrates system setup and how to navigate in Personal Page, is still included.

Whether you stick with the fairly basic 7270 or choose the 7295V for greater processing and storage and full-tilt video, you'll get good value for your money with the Pavilions. Just be sure to add some stronger speakers and a subwoofer if you want to have a party. —Bruce Brown

HP Pavilion 7270. Street price: \$2,650. **HP Pavilion 7295V.** Street price: \$3,950. Hewlett-Packard Co., Cupertino, CA; 800-724-6631; fax, 800-357-1317; www.hp.com/info/pchome1. Circle 444 on reader service card.



"awesome" "fastest" "screamer".

FASTEST...er



November 1998
Laptop Buyers Guide
RE Nimantics NX-Life 133

NSTL Byte Magazine
4-Star Rating



October 1998
Byte Magazine
RE Nimantics Quanta 6X



November 1996
Boot Magazine
RE Nimantics Orion 6X

When we announced the all-new Orion 8X, featuring the 200 MHz Pentium® Processor, superfast EDO RAM, pipeline burst cache, 64 bit video, 16.7 million color hardware MPEG, internal 8X CD-ROM and Zoomed Video Support, we knew we were forcing editors and customers alike to invent new superlatives

Our suggestion
FASTESTer!



ORION 8X-200 Product Specifications



With ultrafast EDO RAM, pipeline burst cache and PCI architecture, waiting is a thing of the past.



Forget 133's and 150's the new Orion 8X is powered by the incredible Intel 200 MHz Pentium® Processor



A dedicated hardware MPEG chip offers Full Motion, full-screen playback up to 16.7 million colors. Coupled with 64-bit PCI Bus Video and 2 MB Video RAM, notebook video never looked so good



A huge, brilliant Super VGA 12.1" Active Matrix Color Screen is standard with the new Orion 8X-200



Surround yourself in rich, full 1 MB wavetable sound



Upload software, play games, or scan CD images at blazing speeds with the standard 8X internal CD-ROM



No more inconvenient drive swapping. The Orion houses CD-ROM, floppy drive, hard drive and battery ALL simultaneously internal



Full Connectivity Orion has Full MIDI/Game Port, TV-Out Jack, and Serial Infrared Port Standard.



Not One or Two, but 3 Type II PCMCIA Slots are included, for all your future needs.



Zoomed Video Card Support is standard too.

- Custom Intel 200 MHz Pentium® Processor
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- 256 KB Pipeline Burst Cache RAM
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- Simultaneous Internal 8X CD-ROM and
- 3.5" 1.44MB Floppy Drive
- 1 MB Wavetable Sound
- Built-In 16.7 Million Color Hardware MPEG
- Zoomed Video Card Socket
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1 from Boot Magazine 11/98 Re Nimantics Orion
2 from Byte Magazine 10/98 Re Nimantics Orion
3 from Byte Magazine 11/98 Jerry Pourmale Re Nimantics Orion

(B) Actual hold time may vary substantially
(A) During working hours

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SUMMARY OF FEATURES

Home PCs



■ YES ■ NO

In alphabetical order by company

	Acer Aspire Personal Solution	Acer Aspire Ultimate Solution	Compaq Presario 4122	Compaq Presario 8712	Gateway P5-166FPC	Gateway G6-200FPC	HP Pavilion 7270	HP Pavilion 7295V
Price of tested configuration	\$2,100 (street)	\$3,300 (street)	\$2,250 (street)	\$4,050 (street)	\$2,354 (direct)	\$3,637 (direct)	\$2,650 (street)	\$3,950 (street)
Processor	IBM 6x86-P166+	Pentium/200	Pentium/150	Pentium/200	Pentium/166	Pentium Pro/200	Pentium/166	Pentium/200
Installed RAM	16MB EDO	32MB EDO	16MB EDO	32MB EDO	16MB EDO	32MB EDO	16MB EDO	32MB EDO
Hard disk capacity and interface	1.9GB EIDE	3.3GB EIDE	2.5GB Fast ATA-2	3.6GB Fast ATA-2	2.4GB Fast ATA-2	3.6GB Fast ATA-2	2.4GB EIDE	3.8GB EIDE
Graphics adapter	Integrated (ATI 3D Rage II)	Integrated (ATI 3D Rage II)	Integrated (S3 ViRGE)	Integrated (S3 ViRGE)	Matrox Millennium	Matrox Millennium	Integrated (S3 ViRGE)	Integrated (S3 ViRGE)
Memory	2MB VRAM	2MB VRAM	2MB EDO	2MB EDO	4MB WRAM	4MB WRAM	2MB EDO	2MB EDO
Secondary graphics adapter (memory)	N/A	N/A	N/A	PowerVR 3D Arcade (4MB)	N/A	N/A	N/A	3Dfx Interactive Voodoo (4MB)
Monitor	AcerView 7156s	AcerView 7176is	Compaq 1525	Compaq 1725	Sony Vivitron 17	Sony Vivitron 1776	Hewlett-Packard D3857A	Hewlett-Packard D3859A
Screen diagonal claimed/measured (inches)	15, 13.8	17, 15.8	15, 13.5	17, 15.8	17, 15.5	17, 16	15, 13.5	17, 15.5
CD-ROM drive (speed)	Acer 685A (8X)	Acer 685A (8X)	Sanyo CRD-168P (8X)	Matsushita CR-583 (8X)	Toshiba XM-5602B (8X)	Mitsumi CRMC-FX2120T (12X)	Goldstar GCD-R580B (8X)	Goldstar GCD-R580B (8X)
Sound adapter	GVC MD-2781	GVC MD-2781	Integrated (ESS AudioDrive)	STB Systems InterWave	Ensoniq VIVO	Ensoniq VIVO	Yamaha OPL YMF701-S	Yamaha OPL YMF701-S
Installed external RAM cache and type	256K pipelined-burst	256K pipelined-burst	N/A	512K pipelined-burst	256K pipelined-burst	256K (integrated on CPU)	256K pipelined-burst	256K pipelined-burst
Motherboard manufacturer	Acer	Acer	Compaq	Compaq	Intel	Intel	Intel	Intel
Chip set	ALI M1521, M1523	ALI M1521, M1523	Intel 82430VX	Intel 82430VX	Intel 82430FX	Intel 82440FX	Intel 82430HX	Intel 82430HX
BIOS manufacturer and version (or date)	Acer 2.1	Acer 2.1	Compaq (6/20/96)	Compaq (6/20/96)	AMI 1.00 02 CN0T	AMI 1.00 04	AMI 1.00.01.DC0L	AMI 1.00.01.DC0L
Expansion-bus slots	3 ISA, 2 PCI, 1 PCI/ISA	3 ISA, 2 PCI, 1 PCI/ISA	2 ISA, 2 PCI	2 ISA, 2 PCI, 1 PCI/ISA	2 ISA, 3 PCI, 1 PCI/ISA	3 ISA, 1 PCI, 3 PCI/ISA	5 ISA, 2 PCI	5 ISA, 2 PCI
Accessible drive bays (5.25", 3.5")	2, 2	2, 2	2, 1	3, 1	3, 0	4, 0	2, 2	2, 2
Internal drive bays (5.25", 3.5")	2, 1	2, 1	1, 0	1, 0	0, 3	0, 6	1, 2	1, 2
Power-supply wattage	147W	147W	147W	147W	145W	200W	160W	160W
Parallel/serial/mouse ports	1, 0, 1	1, 1, 1	1, 1, 1	1, 1, 1	1, 2, 1	1, 2, 1	1, 2, 1	1, 2, 1
Entertainment								
Speakers	Integrated in monitor	Integrated in monitor	JBL Pro Premium	JBL Pro Premium	Altec Lansing ACS40	Altec Lansing ACS40	Altec Lansing Multimedia	Altec Lansing Multimedia
Television board	■	■	■	■	■	■	■	■
Microphone/Headphone	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Joystick	■	■	■	■	■	■	■	■
Modem speed (data/fax, in Kbps)	33.6/14.4	33.6/14.4	33.6/14.4 DSVD	33.6/14.4 DSVD	28.8/14.4	28.8/14.4	28.8/14.4	33.6/14.4 DSVD
Software								
Integrated software	MS Works	MS Works	MS Works	MS Works	MS Works	MS Works	MS Works	MS Works
Windows front end	ACE	ACE	SmartQ Home Base	SmartQ Home Base	None	None	Personal Page	Personal Page
Finance	MS Money, Investor Insight, Quicken Special Edition	Quicken Special Edition 5.0	Quicken Special Edition	Quicken Special Edition	CashGraf, MS Money	CashGraf, MS Money	MS Money, Quicken Special Edition	MS Money, Quicken Special Edition
Reference	Infopedia, Rand McNally Trip-Maker, The Family Doctor	Infopedia, The Family Doctor	Compton's Interactive Encyclopedia 96	Compton's Interactive Encyclopedia 96	Mayo Clinic Family Health, MS Encarta 96	Mayo Clinic Family Health, MS Encarta 96	MS Encarta 96	MS Encarta 96
Service and Support								
Setup poster	■	■	■	■	■	■	■	■
Getting-started video	■	■	■	■	■	■	■	■
Labeled ports	■	■	■	■	■	■	■	■
Color-coded cables	■	■	■	■	■	■	■	■
24-hour, 7-day live technical support	■	■	■	■	■	■	■	■
Standard warranty on parts/labor	3 years/1 year	3 years/1 year	1 year/1 year	1 year/1 year	3 years/3 years	3 years/3 years	1 year/1 year	1 year/1 year
On-site service charge (first year)	Included	Included	Included (90 days)	Included (90 days)	Included	Included	Included	Included

N/A—Not applicable: The product does not have this feature.

PCs
Home PCs



IBM Aptiva C55	IBM Aptiva S78	Micron Home MPC P166	Micron Home MPC P200	NEC Ready 9624	NEC Ready 9628	Packard Bell Platinum 60	Packard Bell Platinum Pro 755	Sony PCV-90	Toshiba Infinia 7200
\$2,460 (street)	\$3,600 (street)	\$2,357 (direct)	\$3,465 (direct)	\$2,350 (street)	\$3,050 (street)	\$2,350 (street)	\$3,390 (street)	\$3,480 (street)	\$3,550 (street)
Pentium/150	Pentium/200	Pentium/166	Pentium/200	Pentium/133	Pentium/166	Pentium/166	Pentium/200	Pentium/200	Pentium/200
16MB EDO	32MB EDO	16MB EDO	32MB EDO	16MB EDO	32MB EDO	16MB EDO	32MB EDO	32MB EDO	32MB EDO
1.9GB EIDE	3GB ATA-3	2GB EIDE	2GB EIDE	1.9GB EIDE	3GB ATA-3	1.5GB EIDE	2.4GB EIDE	2GB EIDE	3GB EIDE
Integrated (ATI 3D Rage)	Integrated (ATI 3D Rage)	Diamond Stealth 3D 2000	Diamond Stealth 3D 2000	Integrated (ATI 3D Rage)	Integrated (ATI 3D Rage)	Integrated (S3 ViRGE)	Integrated (S3 ViRGE)	Integrated (ATI 3D Rage)	Integrated (S3 ViRGE)
2MB EDO	2MB EDO	2MB EDO	4MB EDO	2MB EDO	2MB EDO	2MB EDO	2MB EDO	2MB EDO	2MB EDO
N/A	N/A	N/A	Diamond Monster 3D (4MB)	N/A	N/A	N/A	N/A	N/A	N/A
IBM G50	IBM MM50	Micron 15FGx	ADI LM-1764	NEC MultiSync M500	NEC MultiSync M500	Packard Bell 2020	Packard Bell 3010	Sony CPD-100VS	Toshiba DA1766M-01
15, 13.5	15, 14	15, 13.8	17, 15.9	15, 13.8	15, 13.8	15, 13.8	17, 15.8	15, 14	17, 16
Hitachi CDR-7930 (8X)	Matsushita CR-583-CBZ (8X)	Hitachi CDR-8130 (12X)	Hitachi CDR-8130 (12X)	NEC CDR-1450A (8X)	NEC CDR-1450A (8X)	NEC CDR-1400A (8X)	NEC CDR-1400A (8X)	Sony CDU311-GI (8X)	Toshiba XM-5602B (8X)
Mwave MC2780	Mwave MC2780	Creative Labs Vibra 16C	Creative Labs Vibra 16C	Yamaha OPL YMF701-S	Yamaha OPL YMF701-S	Packard Bell WaveStream	Packard Bell WaveStream	Yamaha OPL YMF701-S	Yamaha OPL YMF701-S
256K pipelined-burst	256K pipelined-burst	512K pipelined-burst	512K pipelined-burst	256K pipelined-burst	256K pipelined-burst	256K pipelined-burst	256K pipelined-burst	256K pipelined-burst	256K pipelined-burst
IBM	IBM	Micronics	Micronics	BCM	NEC	Packard Bell	Packard Bell	Intel/Sony	Intel
Intel 82430VX	Intel 82430VX	Intel 82439HX	Intel 82439HX	Intel 82430VX	Intel 82430VX	Intel 82430VX	Intel 82430VX	Intel 82430HX	Intel 82430HX
IBM (4/2/96)	IBM (6/11/96)	Phoenix 4.05	Phoenix 4.05	Phoenix 4.05.J	Phoenix 4.05 C	AMI 1.00.05.DNOR	AMI 1.00.05.DNOR	AMI 1.00.03.DD04	AMI 1.00.02.DH08
5 ISA, 1 PCI, 1 PCI/ISA	5 ISA, 1 PCI, 1 PCI/ISA	3 ISA, 3 PCI, 1 PCI/ISA	3 ISA, 3 PCI, 1 PCI/ISA	2 ISA, 2 PCI, 1 PCI/ISA	2 ISA, 2 PCI, 1 PCI/ISA	2 ISA, 2 PCI, 1 PCI/ISA	1 ISA, 2 PCI, 2 PCI/ISA	2 ISA, 3 PCI, 1 PCI/ISA	3 ISA, 3 PCI
2, 1	1, 2	2, 0	2, 0	3, 0	3, 0	3, 0	3, 0	3, 0	3, 0
0, 2	2, 2	0, 2	0, 2	0, 1	0, 1	0, 2	0, 2	0, 1	0, 2
145W	145W	235W	235W	200W	200W	200W	200W	200W	200W
1, 1, 1	1, 1, 2	1, 2, 1	1, 2, 1	1, 2, 1	1, 2, 1	1, 1, 1	1, 1, 1	1, 2, 1	1, 1, 1
IBM Aptiva	Integrated in monitor	Advent AV270	Advent AV370	NEC	NEC	Packard Bell 3D Empatheater	Packard Bell 3D Empatheater	Sony	Toshiba
28.8/14.4 DSVD	28.8/14.4 DSVD	33.6/14.4	33.6/14.4	33.6/14.4	33.6/14.4	33.6/14.4	33.6/14.4	28.8/14.4 DSVD	28.8/14.4
Lotus SmartSuite, MS Works	Lotus SmartSuite	MS Works	MS Office Professional	MS Works	MS Works	Corel Office 7, MS Works	Corel Office 7	MS Works	MS Office, MS Works
None	None	None	None	Merlin	Merlin	Navigator	Navigator	VAIO Space	None
Quicken Special Edition, Wall Street Money Special Edition	Quicken Special Edition, Stocks & Mutual Fund Browser	Quicken Financial Pack	Quicken Financial Pack	MS Money	MS Money	MS Money, Quicken Special Edition	Quicken Special Edition, Reuters Money Network	MS Money, Investor Insight, Quicken Special Edition	Investor Insight
MS Encarta 96, Rand McNally TripMaker 96 SE	MS Encarta 96, Rand McNally TripMaker 96 SE	MS Encarta 96, MS Encarta 96 World Atlas	MS Encarta 96, MS Encarta 96 World Atlas	Mayo Clinic Family Health, MS Bookshelf 96, MS Encarta 96	Mayo Clinic Family Health, MS Bookshelf 96, MS Encarta 96	MS Encarta 96	None	The American Heritage Talking Dictionary, Compton's Interactive Encyclopedia, MS Encarta 96	Mayo Clinic Family Health, MS Encarta 96
3 years/1 year	3 years/1 year	3 years/3 years	3 years/3 years	1 year/1 year	1 year/1 year	1 year/1 year	1 year/1 year	1 year/1 year	1 year/1 year
N/A	N/A	Included	Included	Included	Included	Included	Included	Included	Included

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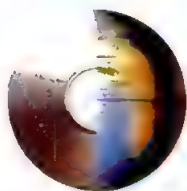
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IBM Consumer Division

Aptiva C55, Aptiva S78

IBM Consumer Division is hitting hard in the home computer market, offering a high-quality basic system in the 150-MHz Pentium-based Aptiva C55 (\$2,460 street) and a new, revolutionary design in its \$3,700 200-MHz Pentium-based Aptiva S78 (\$3,700 street). Both machines are easy to set up, include great sound systems, and have prices commensurate with their

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% needing repair	Better than average

features. The S78 is aimed at knowledgeable second-time buyers, while the C55 makes a good upgrade system or a first PC.

The S78 packs a number of exciting design features. Its 200-MHz Pentium CPU, 32MB of EDO DRAM, 3GB hard disk, and ATI 3D Rage graphics accelerator chip set with 2MB of EDO DRAM are all placed in a



closed-system unit case that can be stashed under your desk. The 8X CD-ROM drive and 3.5-inch floppy disk drive are both enclosed in a single unit (IBM calls it the media console) that sits apart from the system unit, to which it is connected via a thick cable. As long as you

run the cables down the back of your desk or table, you're not likely to be too bothered by them.

All of the S78's components are housed in charcoal-gray enclosures. To set up the system, place the 15-inch monitor with integrated speakers on the andiron-style

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monitor stand, set the media console (which also has a system power switch) directly under the monitor, and put both the system case and the subwoofer under your desk. The subwoofer is a \$99 option included in the price of the tested system. Both the keyboard and wireless mouse receiver plug into the media console.

When you've got everything plugged in, you'll have a hot Pentium system that doesn't show too much (assuming your desk or table is against the wall) but performs well. Though the S78 wasn't the top-rated audio system in this competitive roundup, its volume and sound quality are good enough to make it the source of music at your next party. Compared with other high-end systems in the field, its benchmark test performance was mostly average, except for its above-average score on our Disk WinMark 97 tests, and its below-average score on our Graphics WinMark 97 tests.

The conventional (read: beige) mini-tower C55 is based on a 150-MHz Pentium processor and comes with 16MB of EDO DRAM and a 2GB EIDE hard disk. Like the S78, the C55 uses IBM's

SUITABILITY TO TASK

Aptiva C55

Setup	Good
Edutainment	Excellent
Productivity	Good
Sound	***

Aptiva S78

Setup	Good
Edutainment	Excellent
Productivity	Good
Sound	****

Mwave combination DSVD modem and audio DSP board (the S78's is an enhanced version). Shipping C55s have a 28.8/14.4-Kbps modem that can be flash-upgraded to 33.6-Kbps via a no-cost CD available by mail (the S78's version can be upgraded through IBM's Update Connector online). To complement the Mwave board, both machines include Aptiva

RingCentral software, which allows you to use your new computer as a telephone with an address book, speakerphone, answering machine with voice mail, and fax machine.

The C55 also features an integrated ATI 3D Rage graphics chip set with 2MB of EDO DRAM and a 15-inch IBM monitor. Sound quality is outstandingly clear and distortion-free for PC speakers

without a subwoofer. This unit will also get the job done in the performance arena, and posted mostly average scores for the midrange class. The single exception was its below-average Graphics WinMark 97 result.

Each Aptiva model features a healthy software bundle with titles that should please just about everyone in the family. Notable selections include Lotus SmartSuite and Quicken SE for Mom and Dad, and Mech Warrior 2 and VR Soccer 96 for the kids, as well as Microsoft Encarta 96 and Netscape Navigator for every member of the family. IBM also includes a few educational children's titles in the bundle, and a joystick.

The two units also have IBM's Rapid Resume feature. As in many notebooks, this feature allows your system to 'remember' where you were when you shut it down, and returns you there—to a document, spreadsheet or other application—in seconds upon being turned on again.

If you're buying a first system or upgrading an old one, the Aptiva C55 is a good buy for a midrange Pentium PC

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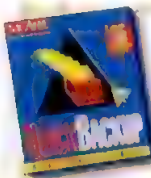
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Aptiva C55. Street price: \$2,460. **Aptiva S78.** Street price: \$3,700. IBM Consumer Division, Research Triangle Park, NC; 800-426-7235, ext. 4340; fax, 800-426-4329; www.pc.ibm.com/aptiva. Circle 445 on reader service card.

Micron Electronics Inc.
**Home MPC P166,
Home MPC P200**

Micron's strong suit has always been excellent performance and its home line continues the trend. The Home MPC P166 and the Home MPC P200 (\$2,357 and \$3,465 direct, respectively) may seem unassuming among this crop of flamboyant PCs, but they differentiate themselves internally

through speedy CD-ROM drives and choice graphics subsystems. Though the P200 is marketed as a premium gaming machine, the P166 could easily assume the same billing; both units have 3-D chips, include 32-bit sound card upgrades, and come with abundant L2 caches. Both are meant as family entertainment PCs, though the P200 includes some features like telephony and software of interest to SOHO users as well. Micron's home machines have not

PC/TV: If You Can't Beat 'Em, Join 'Em

By Bruce Brown

Computers with internal TV tuners started an invasion of the home market in 1996, and if buyer response is enthusiastic it's a good bet combination PC/TVs will be a very big deal. Home electronics traditionally meant television and audio systems, joined by game machines in the early 1980s. Computers for family use in the home, after false starts around the same time, finally became successful when multimedia capabilities and applications became commonplace and affordable.

Combining PCs and TVs raises questions of cost, space, and how to share—and perhaps combine—the separate computing and television functions. We looked at three different PC/TVs, from Gateway, Toshiba, and Packard Bell, to see how well each handled the computer/television convergence challenge.

THE PLAYERS

Gateway 2000 introduced its Destination big-screen PC/TVs, the first systems to be sold with standard cable-ready television tuners, in the spring of 1996. The Destination systems have different computing capabilities, but each one comes with the same television features and with a 31-inch VGA-only screen. They also include a free trial version of Harman Interactive SmartTV, which downloads local cable listings and lets you search, browse, and select from the week's listings.

The Destination features both a wireless radio keyboard and a remote

control, each with TV, volume, audio mute, and sleep buttons so you can run the television function without getting up from your couch. Some of the earliest versions of the Destination had reception problems with the wireless components, but these problems were fixed by late summer.

The Packard Bell Platinum series and Toshiba's Infinia home PCs (both reviewed separately in this feature) also have internal TV tuners. The Platinums and Infinias use traditionally sized (for PCs) 15- and 17-inch monitors, so they're less likely to take over a family room, which is the intended role of Gateway's Destination. But like the Destination, Platinum and Infinia PC/TVs also let you view television in full-screen mode or in a smaller screen within Windows 95.

With a solid cable connection, the television signal quality on the PC monitor/TV combination is comparable to that of a conventional television set. A strong market opportunity exists here, especially among buyers living in

space-challenged apartments and dorm rooms, who may purchase Infinia and Platinum-series PCs just to have a TV and a PC in a compact space. Of more interest than the separate functions (granting that, in each case, you have a fine PC and a fine television) is how television programming and computing can be used together.

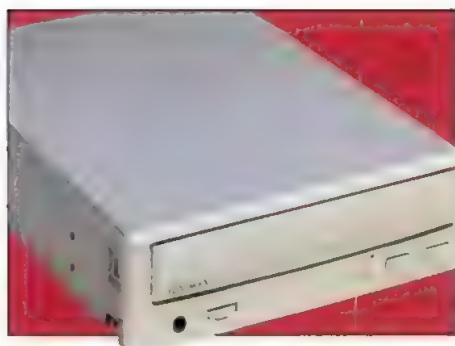
PUTTING THE PC/TV TO WORK

Undoubtedly, television and computer software convergence titles will be developed in the future if PC/TVs become popular; but even now, combining the two functions can be instructive and fun. Watching the NBA finals while hooked into the NBA Web site for instant access to team and player research and to real-time analysis is an example of how one *PC Magazine* staffer used a convergence system this year. Other examples include cruising college Web sites during prime-time TV commercials to keep a daughter tired of the college selection process somewhat focused on the task.

Amateur multimedia enthusiasts may take delight in capturing television screenshots for inclusion in home video productions, and the addition of a VCR and camcorder to the PC/TV multiplies the home production possibilities. Chances are many of the first wave of home PC/TVs will be used to keep a small television window open while doing homework. But no matter how people use them, there's no doubt that these convergence machines present an exciting opportunity.



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adopted the colorful chassis that are currently in vogue, but they do offer easy setup and maintenance. Neophytes will benefit from labeled ports and a setup poster that lists important support numbers. Veteran users can plunge into the system's internals by removing a single thumbscrew. Every user will benefit from the ample software bundles: Each MPC offers myriad edutainment titles, games, reference disks (including Microsoft Encarta 96 Encyclopedia, which includes Encarta's multimedia atlas), and home office software (including Microsoft Works on the P166 and Microsoft Office Professional on the P200, as well as the Quicken Financial Pack from Intuit and Microsoft's Money and Publisher Deluxe programs on both machines).

Both systems use a Diamond Stealth 3-D graphics card, but the P200 supplements this card with an extra 4MB of graphics RAM and a Diamond 3D FX component that features what is known as "Monster 3-D," for faster acceleration and image rendering. In each case, the graphics benchmark test scores were well above average. The 200-MHz machine also ships with a Microsoft Sidewinder game pad, a Microsoft joystick, 32MB of memory, and a 17-inch monitor. Its pair of Advent speakers is augmented by a tremendous subwoofer that is almost as large as the mid-tower

case itself.

The P166 has less memory than the P200 and a smaller monitor. It doesn't include a subwoofer, a game pad, or the 3D FX chip but does have a sticker price

that's roughly \$1,100 cheaper. Both machines also ship with 512K of L2 cache, a 33.6-Kbps telephony modem (supported by Microsoft Phone software), and Hitachi CD-ROM drives averaging 12X in speed that produced the roundup's highest scores on our CD-ROM WinMark 97 test. Though both machines come with 16-bit Creative Labs integrated sound chips, these are upgraded with 32-bit Sound Blaster cards.

In addition to producing stellar graphics and CD-ROM scores, the P200 delivered noteworthy results on most of our other tests as well, with the exception of average disk and processor scores. The P166's scores were mostly average, highlighted by above-average Graphics, Disk, and CD-ROM WinMark 97 scores.

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Micron	
Reliability	Better than average
Repairs	Better than average
Technical support	Better than average
% needing repair	Average



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NEC Computer Systems Division

Ready 9624, Ready 9628

The Ready 9600 line of multimedia home PCs, from NEC Computer Systems Division, is a triumph of value and creativity. With street prices of \$2,350 and \$3,050, respectively, the Ready 9624 and the Ready 9628 support a slick set of peripherals and boast one of the best help tools on the market. These machines are likely to appeal to a broad

SERVICE & RELIABILITY NEC

Reliability	Average
Repairs	Average
Technical support	Average
% needing repair	Better than average

spectrum of users: The less technically sophisticated will enjoy the hand-held remote control units, while anxious SOHO users will be able to back up data

using the integrated Zip drives. The 9624 targets value-conscious users, while the 9628 is aimed at those looking to bring home a system loaded with high-end features.

The 166-MHz Ready 9628 has a front panel with an extensive set of audio controls reminiscent of those on a hi-fi system—speaker volume, balance, fade, bass, and treble can all be adjusted from one location. The system's two speakers bear the NEC name and, along with an integrated stereo amplifier and a Yamaha OPL audio subsystem, deliver modest sound, according to our jury.

The unit offered mixed performance on our tests, earning an above-average Disk WinMark 97 score thanks to a 3GB IBM ATA-3 hard disk. The 8X CD-ROM drive delivered below-average performance, as did the unit's graphics system, based on the ATI 3D Rage chip set and furnished with 2MB of EDO memory. The Winstone and CPUmark results were also below average. (Keep in mind, though, that this machine was

SUITABILITY TO TASK			
Ready 9624		Ready 9628	
Setup	Good	Setup	Good
Entertainment	Good	Entertainment	Good
Productivity	Fair	Productivity	Good
Sound	**	Sound	***

competing against Pentium/200s.) Along with its Pentium/166, the Ready 9628 has 32MB of EDO memory and 256K of secondary cache. A 15-inch NEC monitor

accompanies the unit.

With a price that is \$700 cheaper, the Ready 9624 opts for a Pentium/133 processor, 16MB of RAM, and a 1.9GB

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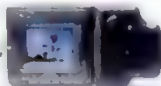
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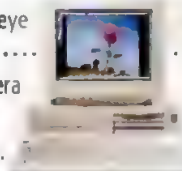
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Maxtor hard disk. The 9624 lacks an audio control panel and an integrated amplifier, but its other components match those of the 9628. Its test scores were all below average for its class (others in this group used 150- and 166-MHz Pentium CPUs).

*NEC's wisecracking
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Each unit boasts two USB ports and 100MB of storage via a standard Iomega Zip drive. Each also has an infrared port that accepts a feed from the remote control. This hand-held device commands volume, pointing-device, CD-ROM, phone, and answering-machine functions when equipped with two AA batteries.

The Ready line's software bundle is terrific. In addition to offering a healthy array of third-party home office and edutainment titles (including the MPEG version of Microsoft Encarta 96, Traveling Software's LapLink, Microsoft Money, and Microsoft Works), this system also provides quick access to what are known as NEC DirectLinks. These desktop icons provide standard Windows 95-type links to an eclectic set of multimedia applications: RingCentral (a phone, fax, and answering-machine package supported by a 33.6-Kbps modem), WebWay (an Internet access tool and organizer that provides a month of free surfing via SpyNet's nationwide service and that also lets you connect to NEC directly for support), a voice recognition program from Verbox, and a proprietary "Stereo System" (complete with an audio mixer, and .WAV, MIDI, and video players).

Should you require assistance with these or any other Ready system functions, a click on another icon will sum-

mon a schmaltzy video avatar named Merlin. Merlin—played with sharp comic flair by a wonderfully versatile live actor—is always good for a laugh and a bit of information; he'll take you on a tour of Windows 95, introduce each of the system's unique features, and talk you through the NEC help database. When you seek help with the CD player, Merlin morphs into a quintessential rock musician with long hair and screaming guitar. When you seek help with wallpaper setting, he becomes a pompous French painter with a pencil-thin mustache and black beret.

Each of these machines will suit the family that wants high-end features at a reasonable price. NEC's Ready units do not offer strong performance, but their strengths dovetail nicely with the home environment.—CM

Ready 9624. Street price: \$2,350. **Ready 9628.** Street price: \$3,050. NEC Computer Systems Division, Sacramento, CA; 800-632-4636, 508-264-8000; fax, 800-366-0476; www.nec.com. Circle 447 on reader service card.

Packard Bell

Packard Bell Platinum 60, Packard Bell Platinum Pro 755

Packard Bell's new Platinum home PCs are well equipped for general-purpose computing, but their distinguishing features are video and communications. Both the midrange \$2,350 (street) 166-MHz Pentium-based Platinum 60 and the high-end, \$3,390 200-MHz Pentium-based Platinum Pro 755 include cable-ready TV tuners and both video conferencing and Internet telephone applications, installed and ready to go.

Both systems perform within expectations; each comes with 256K of pipelined-burst L2 cache, EDO DRAM (the 60 had 16MB while the 755 had 32MB), integrated S3 ViRGE 64-bit PCI 3-D graphics

SERVICE & RELIABILITY

Packard Bell

Reliability	Worse than average
Repairs	Worse than average
Technical support	Worse than average
% needing repair	Average



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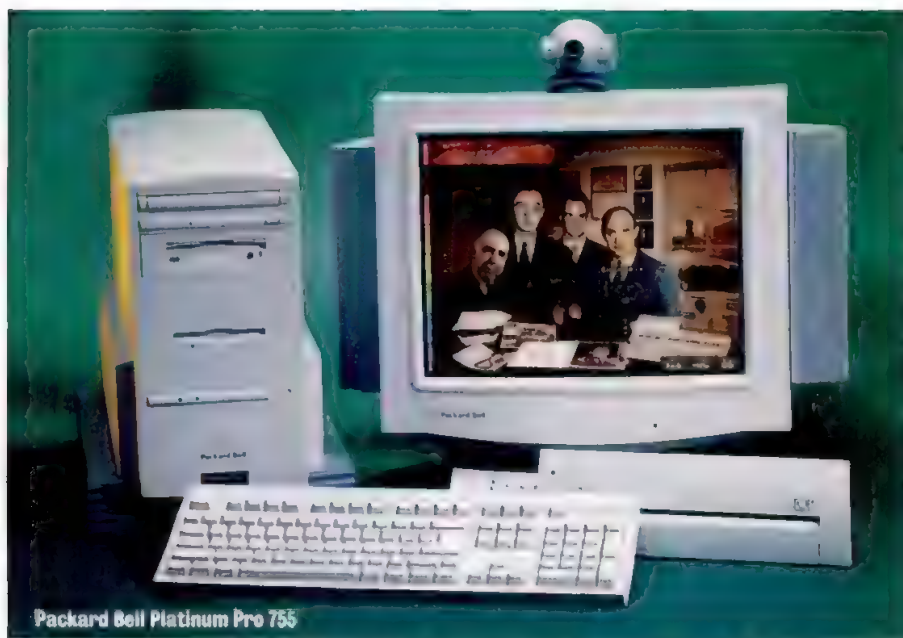
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Packard Bell Platinum Pro 755

chip sets with 2MB of EDO DRAM, and 8X CD-ROM drives. The higher-end Pro 755 model also includes a 100MB Iomega Zip drive. Each unit earned mostly average test scores, except for an above-average Disk WinMark 97 score for the Pro 755 and below average CD-ROM WinMark 97 scores for both.

The big story with these new Packard Bell PCs lies not in the usual features or in their test scores, however, but in impressive video capabilities and the company's emphasis on personal communications. The built-in television tuner included with both machines lets you hook up for full-

screen or partial-screen TV. With the latter you can simultaneously watch television and run regular computer applications—totally in conformance with kids' universal belief that you can't do homework without entertainment to keep you in your seat. With this unit,

you do is receive-only), whether you videoconference using VDOnet's VDO-Phone over standard phone lines or VocalTec's InternetPhone over the Internet (a 33.6/14.4-Kbps modem is included). You can use VDOPhone in conjunction

with a VCR, so friends can watch the same movie with the signal coming over the telephone or the Internet.

Packard Bell's own audio components include 16-bit SRS 3-D sound and BBE High Definition sound enhancement, which together create pleasant sound at fairly low volumes. Don't count on the monitor-mounted speakers (a 15-inch monitor was included with the Platinum 60 and a 17-inch model with the Pro 755) for party-level sound. When you crank up the volume the speakers distort music, ensuring that kids busy with homework won't bother the neighbors.

Because the Platinum series is intended for the whole family, many design elements easing setup and use are in evidence, from the now-common color-coded cables (Packard Bell was the first vendor to use them) to the keyboard with its single-key access to the unit's CD, TV, and phone features. A updated version of the Packard Bell Navigator Windows front end continues to employ the room-based theme of the original but also continues to extract too much of a performance penalty for use

SUITABILITY TO TASK

Packard Bell Platinum 60

Setup	Excellent
Edutainment	Good
Productivity	Good
Sound	★

Packard Bell Platinum Pro 755

Setup	Excellent
Edutainment	Good
Productivity	Good
Sound	★

they'll be able to run MTV in a small screen while working on an expository essay or doing research on the Web.

No camera is included in the system price for the Packard Bells, but you can connect your own camcorder to the PC (without a camera, any videoconferencing

screen or partial-screen TV. With the latter you can simultaneously watch television and run regular computer applications—totally in conformance with kids' universal belief that you can't do homework without entertainment to keep you in your seat. With this unit,

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by any but the very patient.

With an emphasis on communications, video, and television, these Platinum systems are a fine one-stop computer buy, especially for families that want to combine entertainment with computing.—*BB*
Packard Bell Platinum 60. Street price: \$2,350. **Packard Bell Platinum Pro 755.** Street price: \$3,390. Packard Bell, Sacramento, CA; 800-733-5858; www.packardbell.com. Circle 448 on reader service card.

Sony Electronics Inc., Information
Technologies of America

Sony PCV-90

Home PC buyers who are leery of computers in general and want to go with a name synonymous with quality and value are target customers for the new Sony PCV-90 from Sony Electronics. This \$3,480 200-MHz Pentium-based system is a safe buy and a great first effort from Sony, just now entering the home PC market. The high-end PCV-90 is a good deal for people who want performance and features that are high-level but not bleeding-edge, in a system that does a good job of bundling market-proven technologies.

The components for the PCV-90 look fairly typical for a \$3,000-plus machine. The 200-MHz CPU is backed by 32MB of EDO DRAM, 256K of L2 cache, a 2GB hard disk, and today's smart choice, the ATI 3D Rage graphics board with 2MB of EDO DRAM, which accelerates some

3-D game and business graphics. The unit also includes two USB ports.

The system's benchmark test numbers were mostly average. There were two exceptions, however: Its CD-ROM WinMark 97 and Graphics WinMark 97

scores were below average.

When you think of Sony, chances are you think of its consumer audio products or televisions. You won't be disappointed with the sound or video quality of the PCV-90: It looks and sounds great. The unit's 15-inch monitor has a built-in microphone, stereo speakers, and a sub-woofer. The sound—from an on-board Yamaha OPL YMF701-S audio setup with SRS 3-D—is quite crisp and clear at medium listening levels, though this isn't a party sound machine; at high sound levels there is noticeable distortion.

The Trinitron display is very clear and will surely meet the quality expectations for a home system; a bigger screen would be more competitive, however. The enhanced 3-D games that are included show off the system's capabilities well, especially in the case of *WipeOut*, a futuristic racing game. The game's look and performance in this PC version rivals that of video game versions. Sony also bundles a good variety of home productivity and reference titles, including an Acrobat reader, Compton's Interactive Encyclopedia, and

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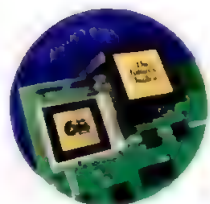
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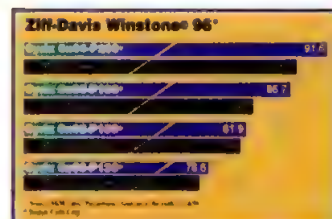


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COMPUTER SHOPPER

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Intuit's Quicken Special Edition.

The PCV-90's most interesting feature is the VAIO Space Windows 95 front end. Alternate interfaces are often patronizing time-wasters, but the VAIO interface combines 3-D graphics, video, and sound for a swoopy, zoomy feeling as you navigate among the application, utility, telecommunications, and entertainment areas. The communications area also includes voice mail and speakerphone applications; the included modem is a 28.8/14.4-Kbps DSVD data/fax model. Since home users want quick access to CD and PC video applications, the VAIO interface dedicates one wall to a full set of multimedia software.

The Sony PCV-90 won't wow you with its performance, but it looks and sounds good and is a pleasure to use with its VAIO Space interface. The PCV-90 is a great entry into the home market, both for the vendor and for buyers.—BB

Sony PCV-90. Street price: \$3,480. Sony Electronics Inc., Information Technologies of America, San Jose, CA; 888-476-6972; www.sony.com/pc. Circle 449 on reader service card.

Toshiba America Information Systems Inc.

Infinia 7200



The \$3,550 (street price) Infinia 7200 from Toshiba America Information Systems is absolutely loaded with fascinating features. Toshiba aims the Infinia at the second-time savvy PC buyer who wants a top-quality system with no compromises. Whether your personal hot button is performance, features, ease of use, or style, the Infinia has to be at or near the top of your list. There are faster PCs and less expensive PCs available today, but none of the other machines we examined in this roundup cover the bases as well as the Infinia does. This stellar package earned our Editors' Choice in the high-end home PC category.

Do you flip for features? How about a 200-MHz Pentium CPU with 256K of L2 cache, 32MB of EDO DRAM, a 3GB hard disk, a 3-D video accelerator, two

USB ports, and a 17-inch monitor with built-in speakers and subwoofer, topped off with an integrated cable-ready TV tuner, radio tuner, voice mail and full-duplex speakerphone, SRS 3-D audio, infrared remote control, and a control module for single-button access to the unit's entertainment and telephony functions? Phew!

Are you impressed with style? All of these attractive elements come in cleverly designed system and monitor cases that combine Buck Rogers-style curves and wings with the midnight-gray coloring of grandma's antique potbellied stove, complete with silver-colored feet.

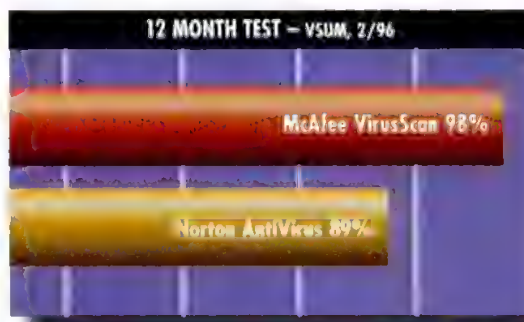
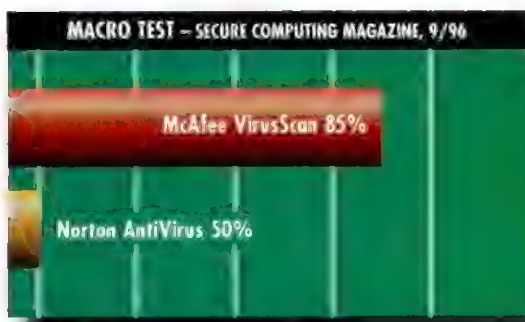
TV in a computer? Maybe you think you don't need or won't use it, but the Infinia makes it easy without requiring you to buy a huge stand and rearrange your family-room furniture for comfortable viewing. The Infinia's 17-inch screen is fine for a den or home office. You can view television via a small window while you run computer programs or pop up to

SUITABILITY TO TASK

Infinia 7200

Setup	Excellent
Edutainment	Good
Productivity	Excellent
Sound	***

WHO SAYS VIRUSSCAN'S MACRO



VIRUS RESEARCHERS.



Everyone says McAfee VirusScan is the world's most effective anti-virus protection. Independent tests prove it. Editorial reviews confirm it. And 68% market share leaves no doubt.

But for some reason, word hasn't reached our friends at Symantec. In a series of highly misleading ads, they claim Norton AntiVirus is superior virus protection.

Fortunately for you, those claims have been exposed and publicly condemned by

everyone from NCSA and *Virus Bulletin* to *Information Week*. The *San Jose Mercury News* referred to the incident as, "Symantec's little fib."

In Symantec's latest ad, they "test" Norton AntiVirus against VirusScan in detecting Word macro viruses. What they don't tell you is that they designed the test, supplied only the viruses that they could detect, and paid for the test themselves. *Secure Computing* calls the results "speculative."

At McAfee, we don't manipulate virus detection tests. We don't have to. As



full-screen viewing. In our testing the television picture quality was comparable to that of conventional sets.

Are you concerned with ease of use? You have the option of using either a remote device or the Infinia's InTouch control module (located below the front of

the monitor) when you want to access the CD, radio, television, answering machine, and speakerphone. Designed to be left on all the time (with sleep buttons on the system, keyboard, monitor, and remote), you can instantly access these noncomputing functions. There's even a big volume dial

like the one on your stereo.

The Infinia's performance was very competitive within the high-end category. It earned average scores across most of our benchmark tests, with one exception. Its S3 ViRGE-based graphics subsystem with 2MB of EDO DRAM, which is optimized for 3-D game functions, could not match those of other units and left the system with a below-average score on our Graphics WinMark 97 tests.

Toshiba also packs a terrific software bundle with the unit. There are titles for the whole family, including Microsoft Encarta 96, Microsoft Office, Netscape Navigator, and SimCity 2000.

The Infinia 7200 is a great value that gives you solid computing performance at a good price with classy styling and loads of "check-it-out" features.—BB □

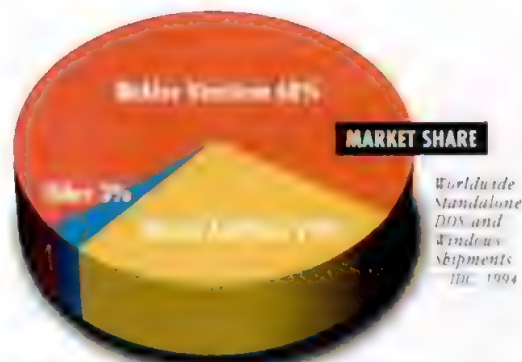
Infinia 7200. Street price: \$3,550. Toshiba America Information Systems Inc., Computer Systems Division, Irvine, CA; 800-334-3445; fax, 800-457-7777; computers.toshiba.com. **Circle 450 on reader service card.**

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—Secure Computing Magazine

"Symantec's macro virus tests show flaws and may be biased." —NCSA

"The results show the technology is there for McAfee to come up trumps."
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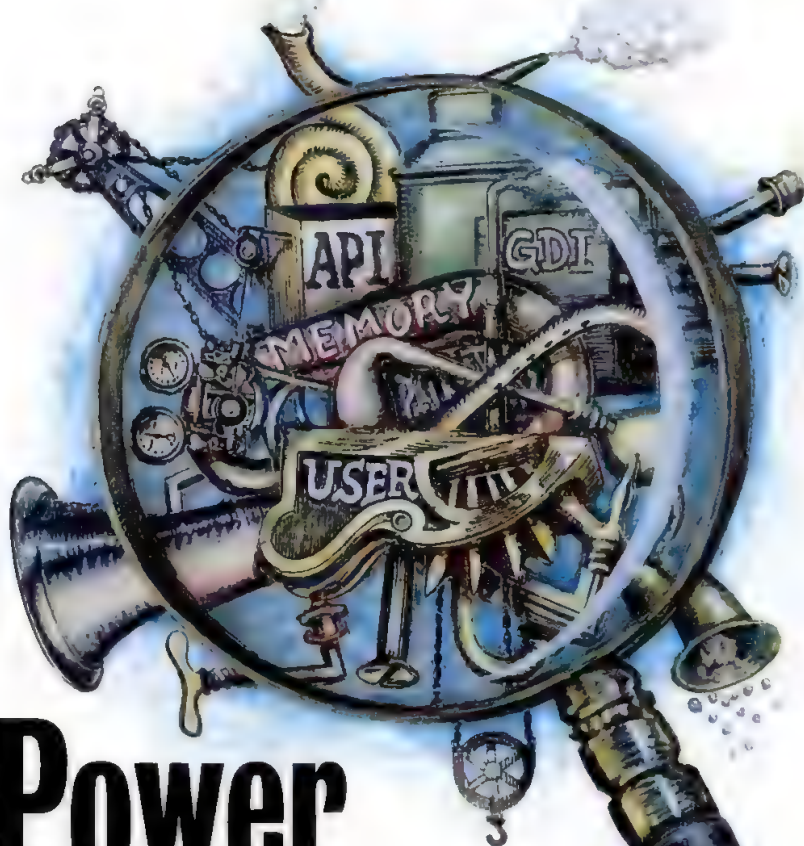
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PC Tech

THE DEFINITIVE GUIDE TO PC TECHNOLOGIES & TOOLS



Power Debugging

Testing tools that let you dig deep inside your Windows programs.

By Douglas Boling

Today's industrial-strength debugging tools offer unprecedented power to Windows programmers, providing the capability to root out some of the most subtle of bugs hidden deep inside Windows programs. And *deep* is the operative word here: Last week's 5,000-byte DOS assembler program grew into yesterday's 100,000-byte Windows C program, which has grown into today's 2MB monster MFC program written in C++. Whereas the bugs in a DOS program could be found by looking in the program's single source file, an MFC program scatters tens of

ILLUSTRATION BY RUSSELL THURSTON

IN THIS SECTION



OPERATING SYSTEMS

Have you hesitated to install Windows 95 because you don't want to give up your tried-and-true operating system? You don't have to give it up. With planning (and a large hard disk), you can have several operating systems on your computer at once. We show you how. *Page 223.*



POWER PROGRAMMING

Microsoft's ActiveX Template Library promises deliverance from much of the drudgery of COM programming. Get set to roll up your sleeves and see what actually building a COM object using ATL is like. *Page 233.*



INTERNET TOOLS

Finding information on the Internet is getting easier and easier, but accessing information directories—sometimes called “white pages”—can still be a dubious proposition. Now LDAP, the Lightweight Directory Access Protocol, promises faster and easier access to this information. *Page 241.*



UTILITIES

Old, unused files can pile up on your system, using precious disk space, but it's not easy to figure out just which files it's safe to get rid of. Our new utility, FDFiles (Find Dead Files), makes it easy to find the files on your hard disk that haven't been accessed in a long time. *Page 249.*

ALSO IN THIS ISSUE In PC Solutions we tell you how to clean up the Run command's list in Windows 95 using the Registry Editor, explain some things about long filenames in Windows 95, list some factors to consider when you're planning on upgrading your PC's microprocessor, reveal how you can change icons in Windows 95, present a way to track changes in Word, and much more. *Page 251.*

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thousands of lines of code in hundreds of source files. The debugging and software-testing tools of yesterday are not merely inadequate—they are laughable in the face of such code bloat.

To the rescue come high-end software-testing tools. These programs track everything from memory usage to OLE interfaces. They don't just find bugs, they guide you to the point of occurrence. They can also mask code sequences that look like bugs but are in reality working as designed. We'll look at two such tools here: NuMega's BoundsChecker Professional and Pure Atria's Purify for Windows NT.

So just what types of errors do these programs find? The main problem areas for Windows programmers are memory leaks, resource leaks, and invalid calls to the Windows API. Memory leaks, in which memory blocks remain allocated after a program terminates, are problems for anyone programming in C or C++. Because C provides little memory management while C++ provides multiple overlapping memory management systems, it's all too easy for a program to allocate a block of memory and never free it. If this happens once during the life of a program, it's no big deal, but if a "leaky" routine is called 10,000 times, the leak can cause quite a problem.

Resource leaks are just a special case of memory leaks. Windows stores different GDI and User objects, such as icons and menus, in memory blocks internal to Windows. Since these buffers are limited, resource leaks can be a serious problem, affecting not just the offending program but all other programs running on the system. Although resource limitations have been somewhat alleviated in Windows 95, the problem still exists.

Ironically, the movement from the segmented memory model of the 286 to the flat, paged memory model of the 386 reduced the ability to track memory overruns. Segments could be sized to fit the allocation request, but memory allocated in a paged memory model (in the case of the x86) can be allocated only in 4K pages. This typically leaves some memory that is writable by a program but officially unallocated, leading to errors that show up only at times Murphy judges sufficiently damaging.

Losing track of memory is only part of the problem. Reading memory that has not first been written to with meaningful data can also cause problems. Likewise, using a pointer to a block of memory that has been previously freed can result in surprisingly subtle bugs that may appear only under certain conditions.

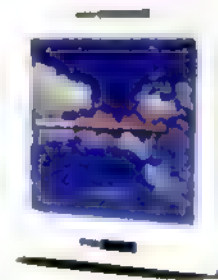
It has also been too easy to pass incorrect

parameters to the Windows API. Many of the most egregious errors were eliminated when Microsoft added a crude level of parameter checking to Windows 3.1, but this catches only passing of null pointers or pointers to unallocated memory. Passing invalid handles or out-of-range values may cause problems that can be

the "error" can be cleared and that it not be reported again. The scope of the masking is also significant. In typical cases only the specific error needs to be masked, but sometimes the requirement is more global. The ability to choose to mask a nonerror at the specific incident, in the current routine, in the current



Bounds-Checker Pro



Purify

FEATURES AT A GLANCE

✓	API checking	✓
✓	Heap checking	✓
✓	Error checking in third-party DLLs	✓
✓	Debug on error	✓
✓	Differentiation of memory leaks from resource leaks	✓
✓	OLE interface checking	✓
✓	API-compatibility checking	✓
✓	API-call logging	✓
✓ ²	IDE integration	✓ ³
✓	Delphi 2.0 support	✓
	Error filter management	✓

(1) Pointers passed to the API are checked for validity. (2) The program adds button-bar and menu items to the Tools menu. (3) Manual integration is available via the Tools menu.

Editors' Choice

• BoundsChecker Professional 4.0



Both BoundsChecker and Purify are powerful testing tools for the Windows programmer, each containing unique features the other could use. The call

to BoundsChecker for the Windows-centric nature of its testing and for its extraordinary degree of integration with the Visual C++ 4.x IDE. Purify's Object Code Insertion technology is powerful and can be less painful to use than BoundsChecker's Compile Time Instrumentation technology, but the overall transparency of BoundsChecker in the IDE means it will be used more frequently by the average programmer.

BoundsChecker has grown up with Windows, and that long association shows. With its Win32 validation function, its reporting of resource leaks separately from memory leaks, and its exhaustive API validation, BoundsChecker is the tool every Windows programmer needs. Given the

subtle but maddening differences between the Windows 95 and Windows NT APIs, it is a decided plus to have BoundsChecker versions for both operating systems. While the maximum error coverage enabled by BoundsChecker's CTI technology may be irritating in its effects on performance, it does seem to root out the subtle pointer bugs that can creep into a C program.

Purify does offer certain advantages, in particular its ability to uncover memory errors within third-party libraries and the lesser impact its OCI instrumentation technique has on performance. All in all, it would be great to have Purify on your machine in addition to both versions of BoundsChecker. But if you have to pick just one, BoundsChecker Professional is your best bet.

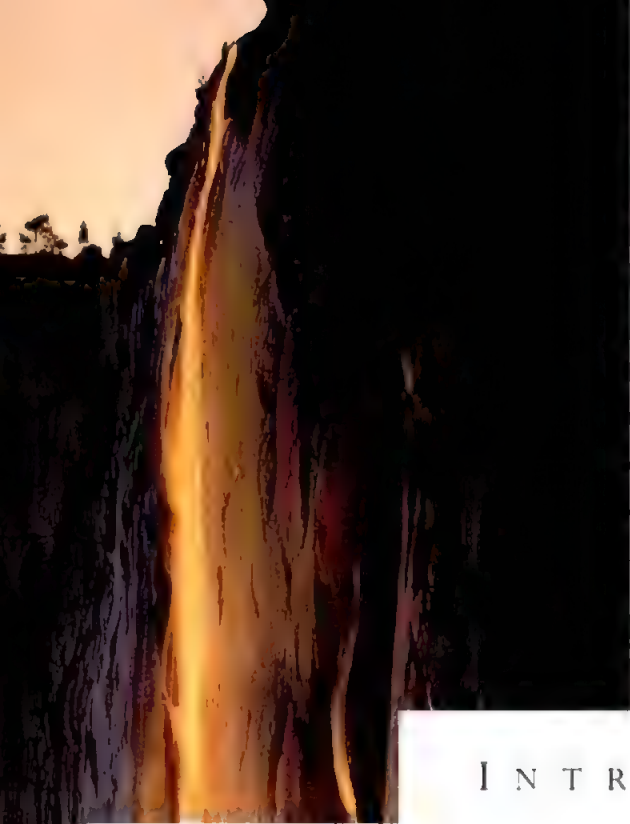
SOON, THERE WILL BE TWO

KINDS OF COMPANIES.

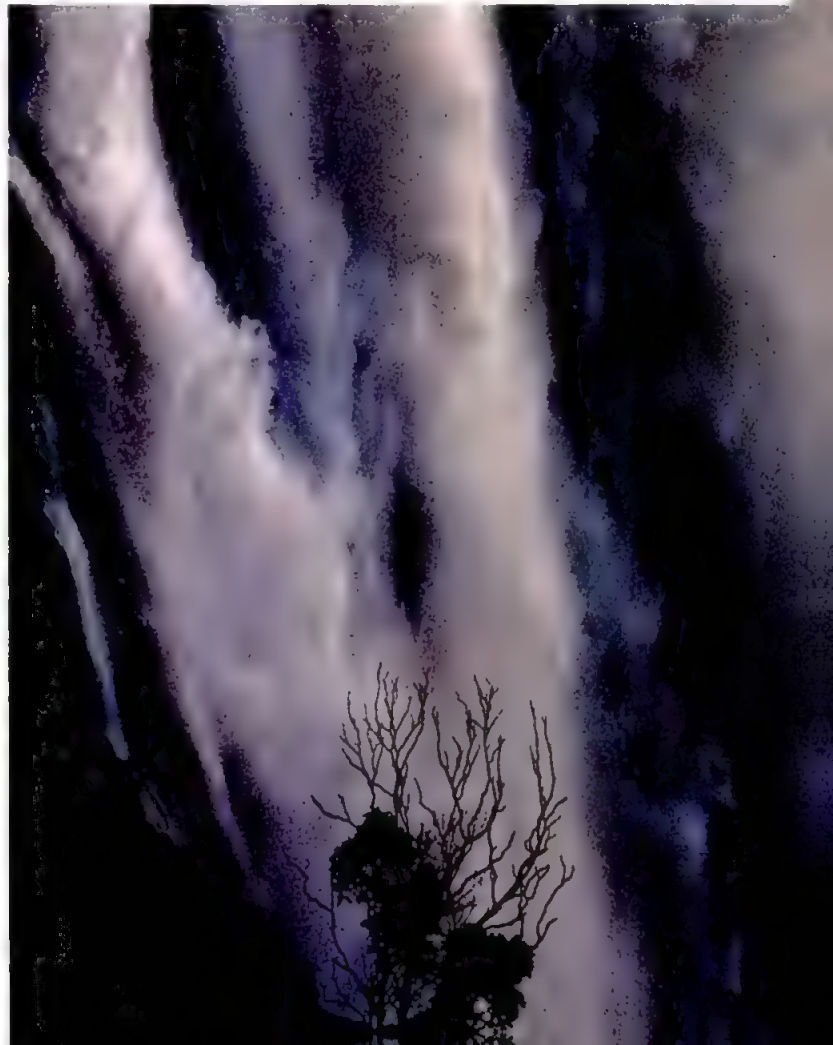
THOSE WHO HAVE ACCESS

AND THOSE WHO SEARCH FOR IT.





INTRODUCING DISTRIBUTED
OPEN SYSTEM AND AN OPEN MIND.



d i s t r i b u t e d



These days, you hear a lot of companies talk about open system computing philosophies, and while Compaq was one of the early pioneers, we believe that it's time to take a big step farther.

a c c e s s To an open business philosophy. A philosophy that begins with something we call Distributed Access.

Distributed Access is not a canned solution. It's not a new piece of hardware or software or a sales force. It's an idea literally based in decentralized network computing environments and figuratively

A C C E S S . T H E D I F F E R E N C E B E T W E E N A N

based in distributing *access* to the people who need it. It's a new model of computing that offers the control of traditional legacy systems and the added flexibility and freedom to help you connect people to people and people to information.

How can we do that? By taking the time to understand not just your computing needs today, but the direction of your entire company. Knowing where you want to go and how you want to get there. But most of all, by knowing that what's truly important isn't computers or computing, it's information.

Finding it. Shaping it. Protecting it. Distributing it. Across the hall or across the globe. If information is the engine that runs today's successful businesses, Distributed Access is the fuel.

Our goal is to make information flow faster, farther, better. When the information that you need, anywhere in your company, anywhere in the world, is as easy to access as the evening news, we'll consider that a job well done.

And a benchmark to beat.

COMPAQ

WE DON'T CLAIM TO HAVE ALL THE ANSWERS JUST THE PARTNERSHIPS TO FIND

d i s t r i b u t e d



a c c e s s

Can one company make an idea like Distributed Access a reality? Yes, if that company doesn't think like one company.

If that company jettisons the one-stop-shopping, "we can do it all" mentality. If that one company keeps an open mind.

In the world of Distributed Access, an open mind is one that is ready and willing to embrace better ideas, no matter where they come from.

At Compaq, we work with Microsoft, Novell, SAP, EDS, Oracle and Intel every day, day in and day out, to make sure that you not only get best-of-breed solutions, but the right best-of-breed solutions. Solutions like that don't happen by phone or fax or by getting together in Las Vegas for a few days. They happen when people roll up their sleeves and work together.

Which is why we have engineers that actually live in Redmond, Washington, constantly testing and improving the performance of Compaq servers

running Windows NT.* Microsoft, on the other hand, tests products like Microsoft Exchange Server* and Microsoft SQL Server* using Compaq servers as their lab.

Our Integration Management solution allows you to integrate Insight Manager with the likes of BMC, Cabletron and Seagate.

Compaq's partnerships with the brightest people in the technology world mean that we see new ideas sooner and, as you might expect, we're able to incorporate them into your business sooner.

The same goes for potential problems. We'll be the first to know and the first to fix the problem. Which means you'll be the last to get burned.

To put it bluntly, when it comes to Distributed Access, partnerships are not considered smart public relations. They are considered the cornerstone of the way we do business.

They keep us one (maybe two) steps ahead of our competition.

And we believe they can do the same for you.

COMPAQ

W E R S ,

TT H E M .



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LET'S GET DOWN

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UNITED STATES

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NORTH ATLANTIC

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CHINA

KAZAKHSTAN

INDIA

SAUDI ARABIA

IRAN

AFGHANISTAN

PAKISTAN

AFRICA

ASIA

AUSTRALIA

NEW ZEALAND

THE WORLD



A L L H E R E ,
T O B U S I N E S S .

Whether they be the plaster partitions of offices, the geographic boundaries of countries or the invisible barriers of time zones, the walls of business are about to come tumbling down thanks to two phenomena known as the Internet and the Intranet.

Through Distributed Access, we intend to not simply help this happen, but to make it happen.

The fact is, Compaq's philosophy—the ongoing establishment of industry standards and development partnerships—perfectly mirrors the foundation upon which the Internet has been based.

d i s t r i b u t e d



a c c e s s

The way we see it, the Internet is not just about reaching out, it's about reaching in. Which is why we've entered into partnerships with the likes of Microsoft, Cisco, BMC Software and Intel to establish Web-based enterprise management tools.

Soon, you will be able to manage complex networks using any Web browser. In other words, reducing both the complexity and cost of systems management by using Internet technologies to solve old problems in new and better ways.

Over the years, a lot of people have talked about the coming of the information superhighway. The fact of the matter is, it's not coming, it's here. It's called the Internet.

Distributed Access can make sure you and your business are drivers, not just passengers.

COMPAQ

Has It Changed Your Life Yet?

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COMPAQ

Has It Changed Your Life Yet?

file, or globally is a handy feature.

Given the nature of MFC and of Windows itself, power testing tools will inevitably report "bugs" in both MFC source code and Windows DLLs. Generally, these are not bugs but the result of a fast-and-loose coding style that takes into consideration insider knowledge of Windows. Testing tools should take these bugs into account and provide predefined filters to reduce the noise level of reported errors in a program.

For best results, debugging tools should be used early in the development process and often thereafter. This is most likely to occur if the debugger is simple to use, is tightly integrated with the development environment, and doesn't slow the program to the point of making it untestable. Debuggers should also be driveable from the command line. In corporate development environments, automated, repeatable testing at regular development milestones is an absolute requirement.

Power like this comes at a price. Both products reviewed here are in the \$500 range, a substantial investment for any programmer. And programs such as these typically are tightly intertwined with the operating system and the programming language, requiring an update with each new version of the operating system or development environment. Both Purify and BoundsChecker, for example, needed updates because of small changes between the final beta version of Windows NT 4.0 and the released code. Because of this, corporate developers should consider a subscription arrangement that provides the necessary updates.

NuMega Technologies

BoundsChecker Professional 4.0



The folks at NuMega Technologies have been writing debugging and testing tools for the DOS and Windows worlds for quite some time. With BoundsChecker 4.0, NuMega has upgraded its flagship product to support ActiveX, DirectX, and the new "Sweeper" Internet API from Microsoft. This release also brings tighter integration with both Microsoft's Visual C++ 4.x and Borland's Delphi 2.0 IDEs.

The best feature of BoundsChecker is that, although it can be run as a separate program, it integrates so tightly into the VC++ 4.x IDE that BoundsChecker and VC++ almost seem to have come out of the same box. Once the program is installed, its functions appear in the IDE menus and a dockable BoundsChecker button bar appears on the screen.

BoundsChecker can be run in its own window or integrated with the IDE. When set in integrated debug mode, BoundsChecker monitors a program in the background as that

program is being debugged in the IDE. When BoundsChecker flags an error, it pops up a window describing the error and lets you acknowledge the error or enter the debugger at the offending line of code. When the tested program is terminated, the test summary information is listed in the IDE's output window. What's more, pressing F4, the key normally used to find the next compiler error in the IDE, cycles through the source code locations of the errors found by BoundsChecker.

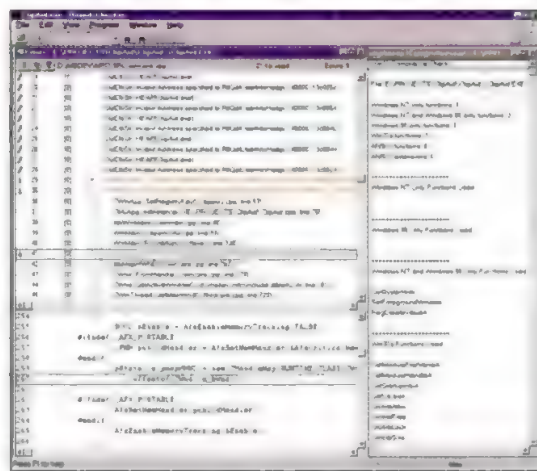
The beauty of the transparent debugging mode is that it is totally painless. You don't need to add any steps to the standard "code, compile,

or higher, however. Programmers using Delphi 2.0 or the other C compilers supported by BoundsChecker are left with the lesser levels of testing.

The instrumented mode of BoundsChecker should be used with care. Although the other error-checking modes are transparent, instrumenting the code and testing can be a chore. NuMega recommends creating a separate build target for your project for the instrumented version. Instrumenting and compiling the code takes much longer than doing a standard build, and the performance of the instrumented code is slow. The other modes of BoundsChecker are

so transparent and painless, you'll probably save CTI testing for when it's absolutely necessary—right before releasing the code, for example, or when you're swatting a particularly nasty bug.

Except in the instrumented mode, BoundsChecker uses what NuMega calls Run Time Instrumentation (RTI)—a fancy term for the rigorous examination of all API calls from an application. This type of scrutiny uncovers a large number of the Windows-related errors in a program. Essentially, BoundsChecker intercepts all calls to the Windows API, as well as to many of the supporting DLLs. When a call is made, the parameters are checked for correctness in the context of the call. Handles are checked for validity, and pointers to buffers are checked to ensure that the buffers exist.



BoundsChecker Pro uses separate child windows to display information about the program being debugged. Here, error information, source code, and Win32 compliance windows are shown.

debug, and correct" process. When an error occurs, a window pops up displaying the error. You then have the options of ignoring the error, filtering any future occurrence of the error, or halting the program in the IDE's debugger.

The IDE integration is not perfect, however. There is no method of masking an error in the IDE—for that, you need to run BoundsChecker in its own window or mask the error as it occurs.

BoundsChecker can be configured for three levels of testing. At the minimum testing level, call stack information is not reported and API return code checking is not performed. At the normal level, the call stack is tracked and return codes are monitored. At the maximum level, tracking is extended to called DLLs, although tests are performed only at calls to the API. Finally, BoundsChecker has an instrumented mode, called Compile Time Instrumentation (CTI), in which it inserts testing code as a program is being compiled. In this mode, BoundsChecker validates individual pointer and array accesses that are independent of the Windows API. CTI also analyzes the source code for errors in a super-LINT type of function. BoundsChecker's CTI ability is available only to users with VC++ 2.1

Since BoundsChecker tracks API calls such as LocalAlloc and GlobalAlloc, it can track memory allocation. The nice thing about RTI is that it requires only a small amount of overhead for this type of checking. NuMega also documents the format of the API verification templates so that API verification can be extended to third-party DLLs.

BoundsChecker can filter errors at a number of levels—individually; within a function, module, or source file; or globally. A comprehensive filter manager is not provided, but the filter files are ASCII, so they can be edited with a text editor.

BoundsChecker's Win32 compliance function can analyze a program's API calls to determine which are specific to Win32s, Windows 95, or Windows NT. This is a handy feature when you're attempting to build applications that run across the Win32 API spectrum. One caveat is that this compliance analysis will not catch problems with limitations on parameters across the same functions. For example, Windows 95 may support a Windows NT function but limit the values of the parameters passed.

Programmers not using Microsoft VC++ can still use BoundsChecker for testing, though

Power Debugging

they lose Compile Time Instrumentation testing and IDE integration. Borland, Symantec, and Watcom C compilers are all supported by BoundsChecker. Delphi programmers lose CTI testing but retain IDE integration. For those who can do without Compile Time Instrumentation, BoundsChecker also comes in a Standard Edition that has all the features of the Professional Edition except Compile Time Instrumentation testing.

NuMega provides a helpful spiral-bound manual that lies flat on the desk, a quick-reference card, and a "Getting Started" booklet. You can also look through the complete online help for assistance.

BoundsChecker Professional for Windows NT; BoundsChecker Professional for Windows 95. List price: \$549 each; both programs, \$849. Supports: Microsoft VC++ 4.0 or later (IDE integration, CTI testing, integrated debugging); Microsoft VC++ 2.1 or later (IDE integration, CTI testing); Borland Delphi 2.0 (IDE integration, no CTI testing); Borland C++, Symantec C++, and Watcom C++ (no IDE integration or CTI testing). NuMega Technologies, Nashua, NH; 603-889-2386; www.numega.com. **Circle 456 on reader service card.**

Pure Atria Corp.

Purify for Windows NT

Pure Software (now Pure Atria Corp.) has been producing automated testing software for the Unix world for a number of years. Now the company has brought its flagship product, Purify, to Windows NT.

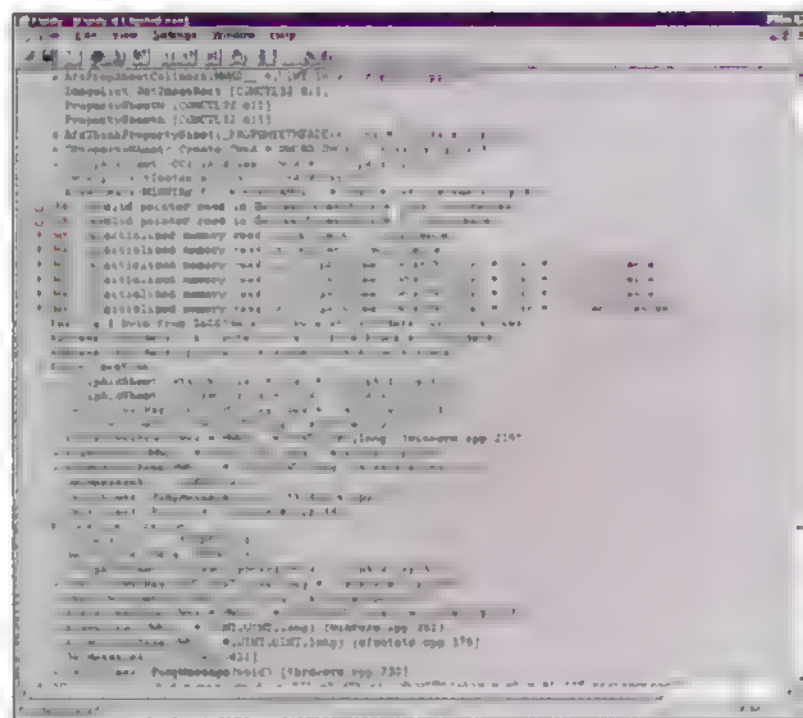
Installing Purify is straightforward, although it was disappointing that Purify did not automatically create a Tools menu entry in my Visual C++ 4.0 IDE. Using the directions in the Purify help file, I was able to create a Purify command on the VC++ Tools menu and have the status output of the Purify instrumentation process appear on a separate tab in the IDE's output window. This is the limit of Purify's IDE integration; all other error reporting is done through Purify's own window.

When launched from the IDE, Purify will instrument an executable file and any DLLs linked to it. This process can take from 15 seconds to several minutes, depending on the length and complexity of the program to be tested and the number of DLLs loaded. Fortunately, Purify caches instrumented DLLs in a special directory so they don't have to be instrumented again—very handy considering it can take a few minutes to instrument MFC40.DLL. Once the loaded DLLs are instrumented and cached, subsequent instrumentation takes place only on modified files, typically within 15 seconds on my 486/100.

After instrumentation, the program is launched. As Purify detects errors, it lists them in the Purify window. Optionally, Purify can halt the program and launch a debugger.

Unfortunately, Purify launches a separate instance of VC++ instead of debugging the program in the original IDE instance. When an error or warning is displayed, the line in question can be expanded to display the call stack from the point at which the error occurred. If the error occurred in a file that has accompanying source code, Purify will display the source code at the location of the error.

The performance of instrumented programs is fair. Although the program being tested slows visibly, testing does not become unbearable. Memory footprint is quite another matter. A short MFC program that used 2MB of RAM in a debug build exploded to 16MB under Purify, not including the 10MB Purify itself uses. With memory prices drop-



Purify's hierarchical display allows expansion of each error line to display the stack frame. Each procedure call in the stack frame can then be expanded to display the source code at that location.

ping, this may not be a big deal, but it should be taken into account when considering the resources needed to run Purify.

Purify reports a vast array of memory errors, including memory leaks, uninitialized reads, reads out of bounds, reading of freed memory, and the like. The program's most powerful feature is that it does not need a file's source code to detect errors. Purify checks for errors using a technology the company calls Object Code Insertion (OCI). Using OCI, Purify analyzes the object code of the program and finds all instances in the code where memory accesses occur. Purify then inserts wrappers around this code that, during runtime, report on the validity of the accesses. Purify also analyzes the machine code of DLLs (aside from the Windows NT system DLLs) that are called and instruments them using the same technique, allowing Purify to locate errors in third-party DLLs even without the source for those libraries.

When the program being tested is terminated, Purify creates a list of the memory blocks the program has not freed. Although

Purify does report both memory and resource leaks, it terms both "memory leaks." While it's true that a resource is just a block of memory, tagging it as a resource would help programmers localize a problem more quickly.

On calls to the Windows API, Purify ensures that a pointer passed to a Windows function points to a valid block of memory, but it does not check that the parameters are valid for that call. For example, Purify does not verify that a call to a GDI function contains a valid handle to a GDI object.

The process of filtering errors can be as simple as right-clicking on the line with the error in the Purify window and selecting the Quick Filter command. More control can be imposed on the reporting of the error by selecting the Create Filter command.

Using this method, a filter can be created to mask any combination of the errors that Purify can report. Errors can be masked globally or within a given module, or the filter can mask all errors *except* the ones listed in the filter.

Purify comes with a handful of predefined filters that are tuned to mask out extraneous errors reported on the Windows NT kernel. Even so, during our testing, Purify reported a number of "errors" that occurred within the MFC source. After verifying that these reports were not relevant to the program being tested, either because they weren't bugs or because they resulted from documented problems with MFC, I was able to filter out the messages. Still, it would have been convenient if appropriate filters had been included in the package.

Filters can be saved in files and shared among programmers. Since these filter files are so much a part of analyzing the errors in a program, Purify includes an Explorer-like filter manager that allows filters to be enabled or disabled individually or in groups.

Another management aid is the Purify Navigator. This specialized view of the standard Purify window lets you manage and view multiple error reports from separate runs of the same or different programs.

Most of Purify's documentation is in the form of an online manual, and the anorexic 36-page paper version seems inadequate for such a powerful program.

Currently, Purify supports only Microsoft VC++ 2.x and 4.x, under Windows NT, Version 3.51 or 4.0. While I ran into some trouble with Purify and long filename support in Windows NT 4.0, an update should be available by the time you read this. And a version of Purify for Windows 95 is planned. □

Purify for Windows NT. List price: \$498; one-year subscription, \$748. Pure Atria Corp., Sunnyvale, CA; 800-353-7873, 408-720-1600; www.pureatria.com. **Circle 457 on reader service card.**



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was our usability testers'

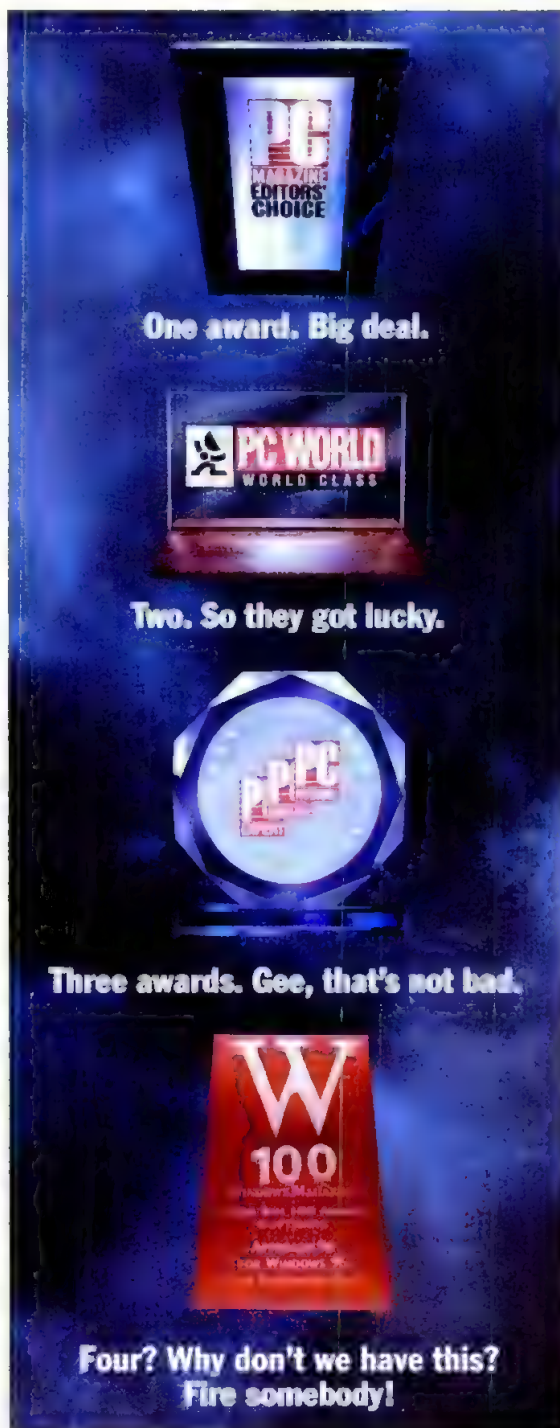
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NEC Technologies Inc.

PowerMate Pro 2200



NEC Technologies' DMI-enabled PowerMate Pro 2200 (\$3,471 street), one of our Editors' Choice winners, has the features, performance, and comprehensive support programs to make it a great choice for corporate use. The unit is a mainstream corporate system targeted for use in financial, engineering, and software development departments. NEC includes numerous hardware and software features, such as network and system management tools, to reduce the cost of ownership and maximize system performance and security. NEC recently merged with Packard Bell to form Packard Bell NEC. NEC will continue to design and oversee the manufacturing of all of its PowerMate commercial desktop systems.

The PowerMate Pro system's tool-free mini-tower case holds an Intel motherboard with the Natoma chip set. To this NEC adds an IBM 2GB 5,400-rpm EIDE hard disk, a Matrox Millennium graphics card with 4MB of WRAM, and an NEC 8X MultiSpin 8V CD-ROM drive. The NEC MultiSync M700 monitor with integrated speakers is DCC-1 and DCC-2 compliant.

On most of our tests, the unit kept pace with the competition well, posting a score on our Winstone 32 tests that was at the high end of the average range. The unit also had average scores on the AutoCAD and C++ tests.

The PowerMate Pro supports DMI, and a MIF browser is available (although one was not sent for this roundup). Also included were MacAfee's VirusScan for NT, Intel's LanDesk and HealthMeter, CyberMedia's First Aid 95, and MagicEye security technology. MagicEye is a combination of hardware and software that detects and reports when the system is opened; it also monitors system temperature, voltages, and fan speeds. The unit also features an IrDA-compliant, 115.2-Kbps infrared interface, which you can put to work with the included copy of Puma's TranXit.

NEC covers this line with a three-year warranty; on-site service is free for the first year. On-site coverage for two more years costs \$99. Augmenting its round-the-clock technical support, NEC has dedicated toll-free support lines for corporate customers, who are routed immediately to PowerMate technical-support specialists. Other service and support programs for corporate customers are available. —BB

PowerMate Pro 2200. Street price: \$3,471. NEC Technologies Inc., Boxborough, MA; 800-632-4636, 508-264-8000; fax, 800-366-0476; www.nec.com. Circle 470 on reader service card.



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In a recent issue of *PC Magazine*, the NEC PowerMate® system won the Editors' Choice Award for Pentium® Pro processor-based PCs. In categories that included features, performance, support and price, we outclassed IBM, Compaq and Dell. For more information, call 1-800-NEC-INFO. Or visit our web site at <http://www.nec.com>. Better yet, simply read what the editors of *PC Magazine* wrote. SEE, HEAR AND FEEL THE DIFFERENCE.™

NEC



PC Tech/Operating Systems

By Sheryl Canter

All on One Computer

Incorporate multiple operating systems on your PC.

Have you hesitated to install Microsoft Windows 95 because you don't want to give up your tried-and-true operating system? You don't have to give it up. With planning (and a large hard disk), you can have several operating systems on your computer at once. Here's how.

ONE PARTITION, TWO PARTITIONS. . .

The first decision you must make when installing multiple operating systems on a single computer is where to put them—in separate partitions or in a single partition. In general, it's best to keep operating systems in separate partitions, though in some cases this requires special measures. Separate partitions make it easier to change your setup down the road. It takes careful planning to put each operating system in its own partition. You must consider the specific requirements of each operating system, as well as the physical constraints of the hard disk.

Hard disks can have a maximum of four partitions, which can be either "primary" or "extended." Primary partitions are required for many operating systems—notably DOS and the boot-up portion of Windows 95. Extended partitions can be subdivided into logical drives and were traditionally used to hold data. Some operating systems, however, such as Microsoft Windows NT and IBM's OS/2 Warp, can be installed in logical drives. You can have any number of logical drives on a physical drive.

Every operating system has a utility for managing hard disk partitions—generally called Fdisk. But not all Fdisks are created equal. Microsoft's Fdisk, which has looked exactly the same through several major revisions of DOS, allows you to create only one primary partition on a hard disk. Since both DOS and the boot-up portion of Windows 95 must be on the primary partition of the first hard disk, this forces you to put them in the same partition. To do otherwise, you need either the Fdisk utility that comes with OS/2, which is both friendlier and more capable than the Microsoft version, or System Commander from V Communications (\$99.95; 408-296-4224).

These options are discussed below.

Unless you use a special tool such as Partition Magic from PowerQuest (\$69.95; 800-379-2566), if you change your hard disk partitioning you will destroy the data on your hard disk. So plan your partitioning scheme carefully. In any case, you should not install a new operating system or make any fundamental changes to your hard disk without first doing a full backup.

If you are installing multiple operating systems on a single computer, you will make your life vastly easier if you do not use disk compression. Each operating system must load compression drivers to read a compressed drive. Even if you are using a compression utility that works under all your operating sys-

cation table) system. Although you lose out on performance advantages, it is better to forgo OS/2's HPFS (high performance file system) and Windows NT's NTFS (new technology file system). Otherwise, you won't be able to access all your partitions at once, which you'll want to do when backing up.

OS/2 WARP AND UNIX

To install OS/2 Warp along with the three Microsoft operating systems, you'll need either the OS/2 Boot Manager or a third-party boot manager such as System Commander. The OS/2 Boot Manager resides in a separate partition on your hard disk. This partition must be either the first or the last physical partition and it must be within the first 1,024 cylinders on the hard disk, so for a large hard disk, you'll want to make it the first partition. If you've already partitioned your hard disk, you can use Partition Magic to create the tiny partition required by Boot Manager without losing the data in your first partition.

Another solution is to use System Commander instead of OS/2 Boot Manager, since it does not require a separate partition. This can be an important consideration if you're installing several operating systems that require primary partitions, such as DOS/Windows 3.1, Windows 95, and most Intel-based Unix operating systems.

If you use OS/2 Boot Manager, you'll need only two boot menu items to access everything: one for OS/2, and one for your Microsoft operating systems. When you select the Microsoft option, you will be presented with the multiboot menus that come with the Microsoft operating systems (described below). System Commander (Figure 1) is a more straightforward solution, since it puts all the available operating systems on one menu instead of forcing you to make choices from successive menus.

Many Intel-based Unix operating systems have strict partition requirements. For example, as well as needing to be in a primary partition on the first hard disk, SCO Unix must be in the active partition. Since the OS/2 Boot Manager

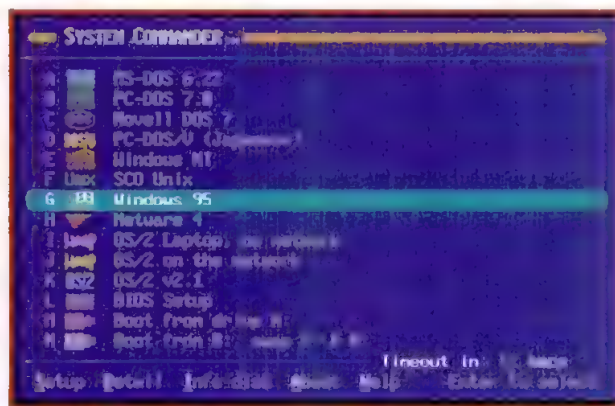


FIGURE 1: System Commander puts all of the available operating systems on one menu instead of forcing you to make choices from successive menus.

tems, disk compression creates problems. If you're running Windows 3.1, you'll have to use 16-bit compression for all your operating systems, which will slow things up for 32-bit operating systems such as Windows 95 and Windows NT. Also, after running the setup program to install the drivers under DOS/Windows 3.1, you'll have to manually install the drivers under your other operating systems—tricky at best. The best approach is to forgo compression and use a very large hard disk.

When installing multiple operating systems, it's also a good idea to use just one file system for all of them if you can. DOS/Windows 3.1, Windows 95, Windows NT, and OS/2 Warp all support the 16-bit FAT (file allo-

must be in the active partition for it to work, you can't use Boot Manager to launch SCO Unix. System Commander, however, can let you access SCO Unix from a multiboot menu. Without System Commander, you'll have to run Fdisk to change the active partition every time you want to switch between SCO Unix and another operating system.

If you have OS/2 Warp, you can use OS/2's Fdisk to force Windows 3.1 and Windows 95 into separate partitions by using Fdisk's ability to create multiple primary partitions. Create a second primary partition and then copy over your entire C: drive, including the root directory and the DOS and Windows directories. When you boot up, the primary partition that isn't in use will be invisible, so you can install Windows 95 in one of them, and the other one—with a working version of DOS/Windows 3.1—will be left untouched. You can then put both partitions on the OS/2 Boot Manager menu so you can select between them on start-up. If you don't have OS/2, the only way to put Windows 3.1 and Windows 95 in separate partitions is with System Commander.

THE MICROSOFT-ONLY SOLUTION

If the only operating systems you want to use are DOS/Windows 3.1, Windows 95, and Windows NT, you don't need anything beyond the multiboot tools that come with the Microsoft operating systems, but there are disadvantages to this approach. One is the inconvenience of two levels of nested menus. First you get the Windows NT OS-Loader menu, which (confusingly) lists Windows 95 as "MS-DOS." If you select MS-DOS, you then advance to the Windows 95 multiboot menu, from which you can select your prior version of DOS and Windows 3.1.

A second disadvantage arises from the fact that the Microsoft tools force you to install Windows 3.1 and Windows 95 in the same partition. Your Windows 3.1 applications will not be migrated to Windows 95; you'll have to set them up manually or else reinstall them.

If you use the multiboot capability in Windows 95 to retain old DOS and Windows 3.1, back up your DOS directory before installing Windows 95. A convenient way to do this is to create a subdirectory with a name that does not contain the letters *DOS*, and then copy your working DOS directory to the backup directory. If you fail to do this and you ever need to reinstall Windows 95 to correct a problem, you will lose the ability to boot to old DOS.

Here's why: When you install Windows 95 from Windows 3.1, the installation procedure gives you the option of setting up your system for multibooting. Once Windows 95 is installed, you can reinstall it only from within Windows 95; if you try to reinstall from Windows 3.1, it won't let you. But when you install from Windows 95, the installation procedure

fails to check for a multiboot setup, and there is no way to tell it you want the multiboot option. Thus the installation program assumes you are replacing old DOS and Windows 3.1 with Windows 95 and goes on a search-and-destroy mission targeted mainly at your old DOS directory. Some files are added; many files are deleted or replaced. Unless you have backed up your DOS directory where Windows 95 can't find it (which is why you should not use the letters *Dos* in the backup directory name), you will no longer be able to boot to your old version of DOS.

WINDOWS 95'S MULTIBOOT OPTIONS

Configuration options for the Windows 95 multiboot menu are stored in a hidden text file in the root directory of your boot drive, called MSDOS.SYS. This file is organized like an .INI file, with section headers and keys. You can edit the file with Windows Notepad if you temporarily remove the hidden and read-only attributes. When you are done editing the file, you should restore these attributes.

All the relevant keys for multibooting are placed in the [Options] section of MSDOS.SYS. Windows 95 does not write most of these keys to the file during installation because it uses the default settings, but you can add them.

By default, Windows 95 is configured so the boot menu is not displayed. You can bring it up, however, by pressing F8 when you see *Starting Windows 95* at the top of your screen. By default, Windows 95 gives you 2 seconds to do this before it boots into Windows 95. This behavior is controlled by three keys that do not appear in the file, because Windows 95 is using their default settings. These are `BootMenu=0`, `BootKeys=1`, and `BootDelay=2`.

The `BootMenu` key tells Windows 95 whether or not to display the boot menu. The default value of 0 says not to display the menu. If you'd like to see the menu each time you boot up, change this value to 1. The `BootKeys` key controls whether boot option hotkeys, such as F8 for the boot menu, are enabled. A value of 1 means they are enabled. If the boot menu is not displayed by default, this is the only way you can bring it up. The `BootDelay` key specifies how long to wait for a hotkey before booting Windows 95. The default delay is 2 seconds. If you have set the `BootMenu` value to 1, then the boot-up hotkeys and boot delay are unnecessary, and you assign both `BootKeys` and `BootDelay` a value of 0 to speed up the boot process.

The other two keys that control the manner in which Windows 95 loads are `BootGUI=1` and `Logo=1`.

The `BootGUI` key determines whether Windows 95 boots to the Windows 95 graphical shell or to the DOS 7 command prompt. Setting the value of this key to 1, the default, is analogous to launching Windows 3.1 automatically by putting a WIN statement at the end of

your AUTOEXEC.BAT file under old DOS. If you set `BootGUI` to a value of 0, the boot process will stop at the DOS 7 command prompt. You can then launch the Windows 95 shell by typing the WIN command. The Logo key determines whether Windows 95 displays its logo before loading the shell. A value of 1, the default, means it does. You can speed up the boot process by setting the Logo value to 0.

Booting to the Windows 95 DOS 7 command prompt is not the same as booting to old DOS; you cannot run Windows 3.1 from DOS 7. To run Windows 3.1, you need a valid installation of your old version of DOS. If you chose the multiboot option when installing Windows 95, you will see the key `BootMulti=1` under the [Options] section.

A value of 1 for this key inserts an additional entry into the Windows 95 boot menu called *Previous version of DOS*. You can manually add this entry to MSDOS.SYS even if you haven't retained your old version of DOS: You'll see the option on the boot menu, but if you select it without a proper old DOS setup, your system will crash. Assuming you have a valid multiboot setup, you can bypass the boot menu and still get to old DOS by pressing the F4 hotkey when you see *Starting Windows 95* at the top of the screen. You can set up your system to boot old DOS by default by inserting the key `BootWin=0` into MSDOS.SYS. When `BootMulti` is set to 1, a value of 0 for `BootWin` tells the system to boot old DOS.

BACKING IT ALL UP

Having multiple operating systems on one computer creates some unique problems when backing up and restoring your hard disk. This is especially true when you have to restore from scratch. The difficulty arises because you cannot back up and restore the master boot record and partition boot records along with your files. The master boot record controls which partition the system boots from. (System Commander works by replacing the master boot record on your hard disk.) The partition boot records store information about what files to load at boot-up, and thus control the boot process in each bootable partition.

In general, the master boot record is only modified if you create or delete partitions with Fdisk, or if you explicitly re-create the master boot record with the Fdisk /mbr parameter. Partition boot records are modified when you format a disk, install a new operating system, or use the SYS command (or its equivalent) to transfer operating system files to a disk. To restore a multiboot system from scratch, you must correctly restore your boot records as well as your files. One way to do this is to reinstall all your operating systems, but this takes a lot of time on a multiboot system. If you're careful, you can avoid this.

If you used the FAT file system for all your partitions, then—with some initial prepara-

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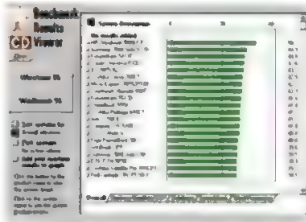
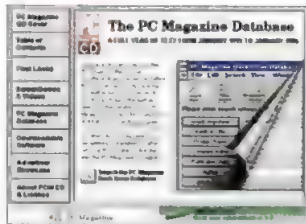
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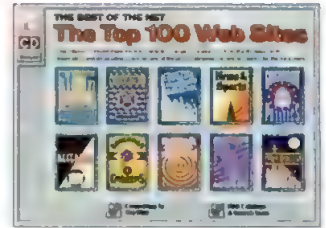
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tion—you can use DOS backup software for all your operating systems and data. Because DOS is so small and simple, you can boot from a floppy and reinstall your backup software in a matter of minutes. To use DOS backup software for Windows 95 partitions, you must first strip off the Windows 95 long filenames and save them to a file. The CD version of Windows 95 comes with a utility to perform this task called Long Filename Backup (LFNBK.EXE). If you don't have the CD version of Windows 95, you can download this utility from Microsoft's Web site. The URL is www.microsoft.com/windows/software/admintools.htm.

Long Filename Backup requires you to make a Control Panel change before backing up, and then restore the original setting after restoring your long filenames. Instructions for doing this are included with the utility. If you have a copy of Stacker 4.1 from Stac Electronics, you can avoid this inconvenience by using the Savelfn utility that comes with this program instead. Savelfn does the same thing as Lfnbk, but doesn't require you to change any Control Panel settings.

To back up an OS/2 partition with DOS backup software, you must first use a utility such as Eabackup. This is a freeware program that you can download from CompuServe (Type GO C1S:OS2USER, and download EABK23.ZIP from Library 4). This utility strips off your ex-

tended attributes and saves them to a file; a companion utility, Earestor, uses this file to restore your extended attributes.

Once you've taken these extra steps for Windows 95 and OS/2, you can use a DOS backup program to back up all your operating systems at once. Make sure your backup software is set up to save hidden and system files.

If you don't have to repartition or reformat your hard disk, restoration is easy. After restoring the files from your backup media, use the utilities described above to restore your Windows 95 long filenames and your OS/2 extended attributes, and everything will work fine. If, however, you must repartition or reformat your hard disk and restore from scratch, you must also worry about restoring the boot records.

Theoretically, you can use any operating system's Fdisk and Format utilities to partition and format your hard disk, and then use the SYS command (or its equivalent) to fix up the partition records afterwards. You can do this with your Windows 95 partition if you have a Windows 95 start-up disk, but there is a hidden danger: The Windows 95 SYS command overwrites the version of MSDOS.SYS on the target disk with the version on the source disk, which can wipe out your carefully configured boot options. To avoid this, make sure your start-up disk contains the Fdisk and Format utilities, and use Windows 95 to create and format your

partitions. To create a Windows 95 start-up disk, use the Add/Remove Programs utility in Control Panel.

After you've partitioned and formatted your disk, restored your files, and restored your long filenames and extended attributes, you'll still need to do a little bit of work in order for Windows NT and OS/2 Warp to work correctly. If you made a Windows NT Emergency Repair disk, you can use this to fix up the partition boot record for Windows NT. If you don't have this disk, you'll have to reinstall Windows NT.

To fix up the OS/2 partition boot record, use the SYSINSTX command, which is the OS/2 equivalent of the Microsoft SYS command. This utility can be found in the \OS2\INSTALL\BOOTDISK\ directory on your OS/2 partition. If you have correctly backed up and restored your OS/2 extended attributes, this should complete the restoration of OS/2 Warp.

It's worth noting that if you use System Commander, you don't have to worry about the boot records because System Commander takes care of them for you.

It can be tricky to install multiple operating systems on one computer, but it's quite convenient to have them there once it's done. □

Sheryl Canter is a contributing editor of PC Magazine.

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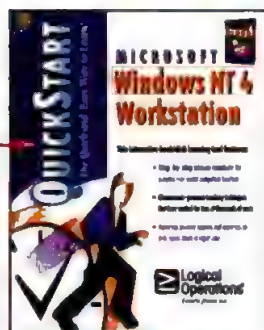
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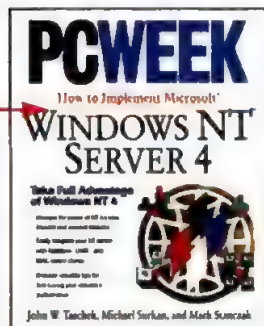


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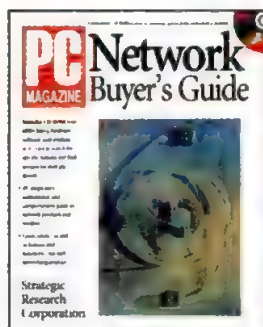


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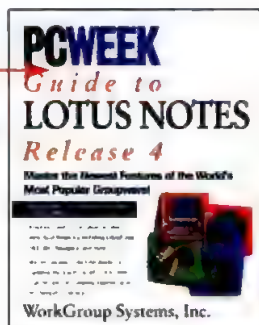
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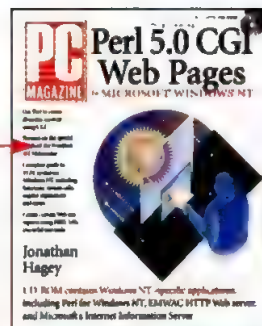
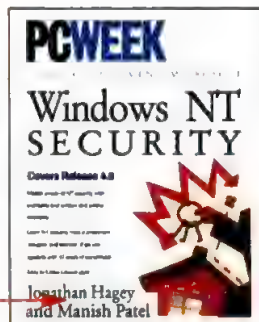
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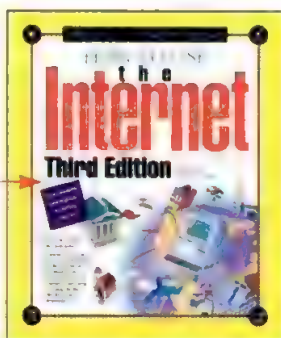
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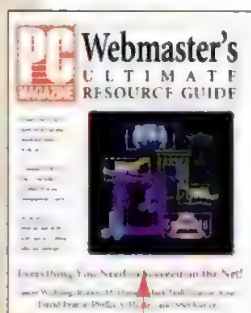
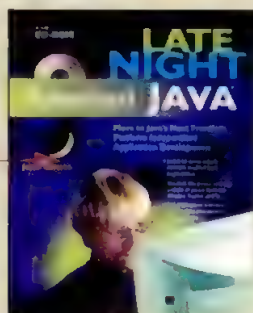
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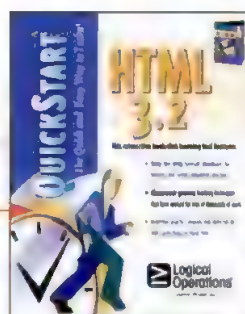
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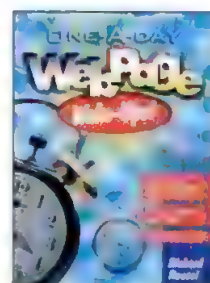
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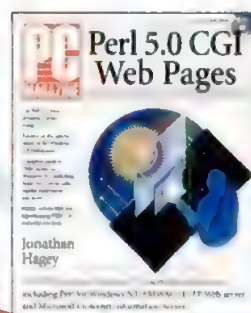
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PC Tech/Power Programming

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Building a COM Object with ATL

Getting started with the ActiveX Template Library COM Wizard.

Last time, we discussed templates, took a look at MFC and how it attempts to help you program COM objects, and gave an overview of the capabilities the ActiveX Template Library (ATL) brings to the COM object programming party. This time, we'll get our hands dirty and show you what it's like to build a COM object using ATL. All the files mentioned in this column are available from PC Magazine Online (www.pcmag.com). You can download Version 1.1 of ATL for free from Microsoft's Web site, at www.microsoft.com/visual/atl11. You'll need Visual C++ 4.1 or higher to use this version of ATL.

IT ALL BEGINS WITH A WIZARD

Your first experience with ATL will begin with the new ATL COM AppWizard. In our tour of ATL, we'll build a simple, DLL-based dual-interface COM object. Create a new project workspace in Developer Studio and choose the ATL COM AppWizard as the project type. (We've named our project ATLTEST.) From the dialog box that appears (pictured in Figure 1), you can set up your initial project options.

You can see that the wizard gives you a lot of options for your new COM project. While others are possible, the options shown in Figure 1 are likely to be the ones you'll need to build your COM object. Later I'll discuss how to choose different sets of options depending on your requirements. But for the time being, let's select the ones in Figure 1.

We now have the ability to edit all of the names generated for us by the wizard. Once again, we'll select the defaults and let the wizard generate our skeleton ATL COM project. A summary of the files generated by the wizard is shown in Figure 2.

Now that we've successfully created a skeleton ATL application, let's examine the files that the wizard created for us.

KEEPING THE BOOKS

Atltest.cpp handles most of the bookkeeping details required for a DLL-based COM object. It implements four exported functions that all such objects should implement. The first two, DllGetClassObject and DllCanUnloadNow, are required. They are the entry points through which COM libraries can create new COM objects contained in your DLL and

query whether it is safe to unload your DLL. The other two, DllRegisterServer and DllUnregisterServer, are optional. They do, however, make life much easier for you, because they allow your DLL to register and unregister itself with the Windows Registry, thus eliminating the need for you to maintain separate .REG files for registering your COM server. It is highly unlikely that you would ever have to edit Atltest.cpp.

DESCRIBING THE COM OBJECT IN IDL

Atltest.IDL is the Interface Definition Language (IDL) file that describes your COM object and its COM interfaces. Typically, you'll update the file regularly as you add, remove, or change your COM object's interface definitions. An excerpt from the Atltest.IDL file is shown below:

```
// This file will be processed by the
// MIDL tool to
// produce the type library
// (Atltest.tlb) and
// marshaling code.
[
    object,
    uuid(7D785DE3-07C0-11D0-896C-
        444553540000),
    dual,
    helpstring("IAtltest1 Interface"),
    pointer_default(unique)
]
interface IAtltest1 : IDispatch
{
    import "oaidl.idl";
    HRESULT Bar( [in] BSTR s );
    // Our sample function
};
```

As you can see, the excerpt contains the interface identifier (IID) for your COM object's dual interface. I've added a sample function, Bar, to show what a typical function prototype in IDL looks like. It's not much different from C++, except for the [in] directive required by MIDL to generate the correct marshaling code—the code that packages the interfaces for remote operation—for the parameter.

Depending on what options you originally selected in the COM AppWizard, ATL will use the Microsoft IDL Compiler (MIDL) to

generate a number of output files. MIDL can generate a binary type library file that contains descriptions of all of the COM objects in your DLL. The file supports hundreds of specific fields that can be set by directives in the Atltest.IDL file.

The type library file can be used in a number of different ways. A developer can use a tool such as OLE2VIEW (which also comes with the Win32 SDK) to browse your type library file and determine your COM object's capabilities. Other tools, such as Visual Basic, can read a type library file to perform type-checking of VB code to ensure that the names of the functions and the types of their parameters match before attempting to call a COM object.

If you choose the custom interface option in the ATL COM AppWizard, MIDL will also generate the following set of C source code files: Atltest_i.c, Atltest_p.c, Atltest1.h, dlldata.c. They can be compiled using the ATLTESTIPS.MAK file generated by the COM AppWizard. The files contain marshaling code required to make your COM interfaces callable by applications running in different Win32 processes. The code is not required by DLL-based COM objects, because Windows will automatically map your DLL into the process space of whatever

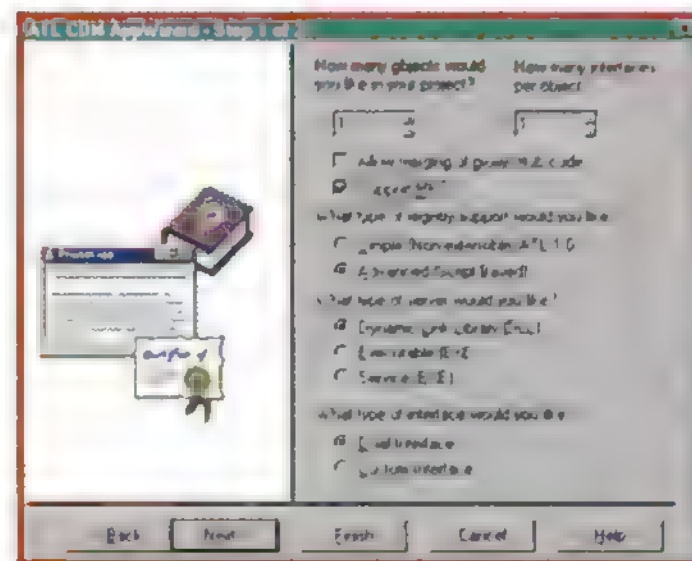


FIGURE 1: The first step in creating a new COM object using the ATL COM AppWizard.

application requests your COM object's services. If you are building an .EXE-based COM object, you will have to compile the MIDL-generated files to create the correct marshaling code for your COM interfaces. Since your .EXE-based COM objects are

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guaranteed to run in their own Win32 processes, you need the marshaling code to allow applications in other Win32 processes to access your COM object's interfaces.

DECLARING INTERFACES AND FUNCTIONS

Atltest1.h contains the declarations of your COM object's interfaces and interface member functions. You must edit this file and the Atltest.IDL file manually whenever you add, remove, or change your COM interfaces' definitions.

The following code sample shows a very important difference between the way ATL handles COM objects and the way MFC handles COM objects:

```
class CAtltest1 :
public CComDualImpl<IAtltest1,
&IID_IAtltest1, &LIBID_ATLTESTLib>,
public ISupportErrorInfo,
public CComObjectRoot,
public CComCoClass<CAtltest1,
&CLSID_CAtltest1>
```

As you can see, ATL is using C++ multiple inheritance to implement multiple interfaces on a single COM object. This is a simple and far more elegant solution than MFC's use of nested classes to handle multiple interfaces. By eliminating the need for nested classes,

you no longer have to use the METHOD_PROLOGUE macro to generate the equivalent of a this pointer.

Also note the extensive use of templates for generating the code that implements the IUnknown handler and the dual interface handler for your COM object. Your COM object will have only the code required to handle the interface type you specified in the COM AppWizard. No extra library code will be compiled into your final application, so you'll have much greater control over its size.

Further on in the class declaration, you will add your declarations for your COM interface's member functions:

```
// IAtltest1
public:
    STDMETHOD(Bar)(BSTR s);
};
```

You'll also edit this section of the file to include the declarations of your COM interface's member functions. In our example, I used the STDMETHOD macro to declare an interface function called Bar that takes a single BSTR (BASIC string) parameter. You can define your member functions and their parameters similarly, regardless of whether you're creating a custom COM interface or a dual COM interface.

METHOD IMPLEMENTATION

Atltest1.cpp contains the implementation of your COM object's methods. Here the COM AppWizard has already generated a default implementation for the ISupportErrorInfo interface for you.

Typically, you'll add your COM interface method implementation using the STDMETHODIMP macro, as shown in the following example:

```
STDMETHODIMP CAtltest1::Bar( BSTR s )
{
    CString str = s;
    AfxMessageBox( str );
    return S_OK;
}
```

All COM objects must return a standard error code, known as an HRESULT. A return value of S_OK indicates no errors. If an error does occur, you can return one of the standard HRESULT error codes defined in the winerror.h file that is part of the Win32 SDK and resides in your \msdev\include directory.

C++ INTERFACE DECLARATIONS

MIDL generates Atltest.h automatically when you build your COM object. In it you will find the C++ declarations of all of the COM interfaces in your object. Here is the declaration of

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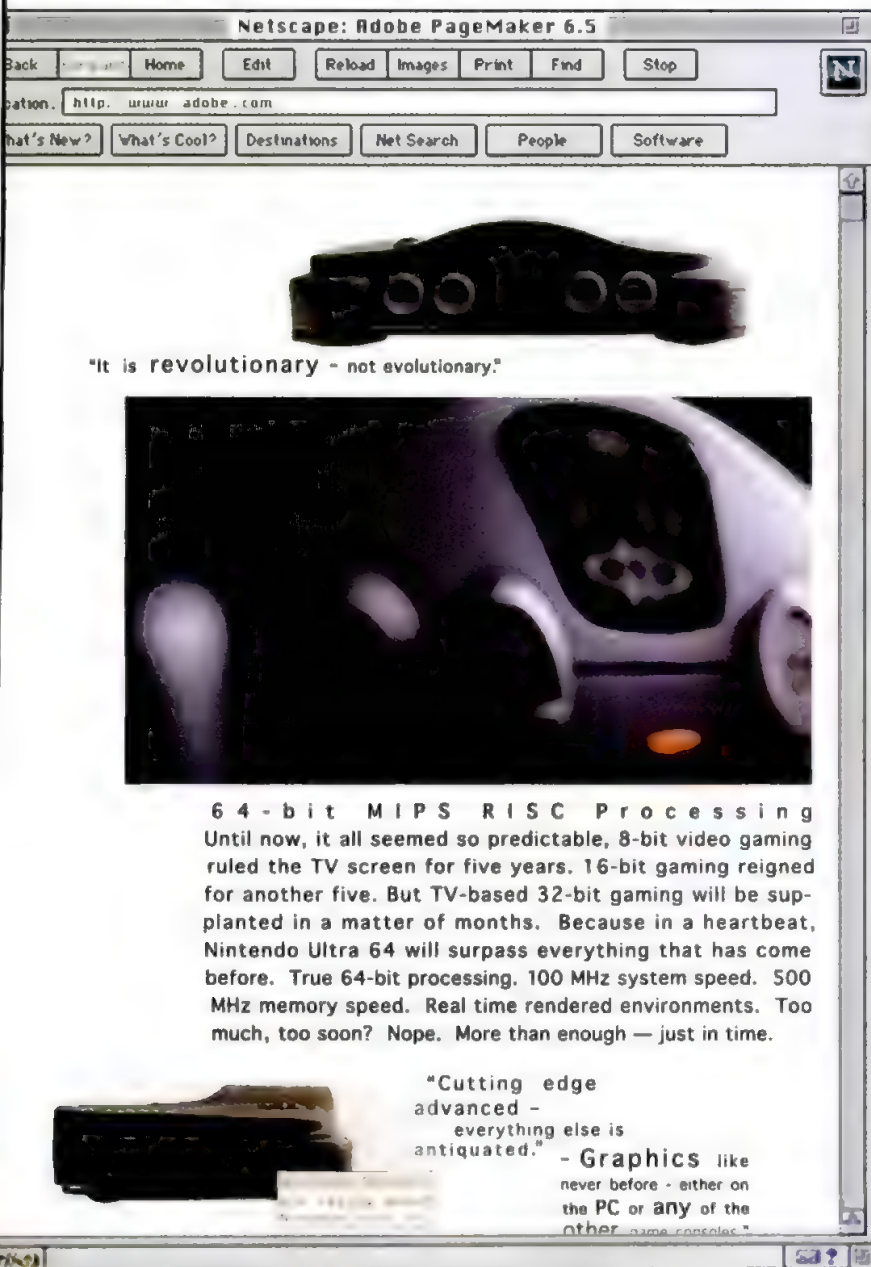
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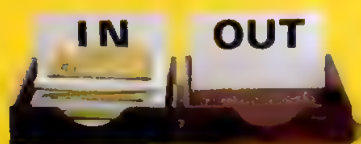
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our ISimpleObj COM interface, as generated by MIDL:

```
interface IAttest1 : public IDispatch
{
public:
virtual HRESULT STDMETHODCALLTYPE
Bar( /* [in] */ BSTR s) = 0;
};
```

When changing your COM object's interface signature you don't need to edit this file. To do so, you must update the Attest.IDL and the Attest1.h files. It is very important that you keep these files in sync with each other, as they define the interface signature of your COM object.

STORING C++-COMPATIBLE GUIDS

Attest_i.c contains all of the GUIDs required by your application. The COM AppWizard generates them for you by calling the COM API function CoCreateGuid. But all the GUID values are stored by the wizard in your Attest.IDL file as various parameters. Fortunately, MIDL will read your IDL file and build C++-compatible declarations for your GUIDs, as shown below:

```
const IID IID_IAttest1 =
{0x87E49D4B,0x057A,0x11D0,{0x89,0x6C,
0x44,0x45,0x53,0x54,0x00,0x00}};
```

```
const IID LIBID_AttestLib =
{0x87E49D49,0x057A,0x11D0,{0x89,0x6C,
0x44,0x45,0x53,0x54,0x00,0x00}};
```

CHOOSING WIZARD OPTIONS

In this section, we're going to examine the wizard's various options and see how you can choose from among them.

Perhaps the most important decision you can make is whether you are going to package your COM object in a DLL or an .EXE file. Your choice will have significant consequences on how well your COM object is going to perform and how robust it will be.

To put it simply, it's much faster—several orders of magnitude faster—to make calls to a COM object packaged in a DLL than to one packaged in an .EXE file. Keep in mind, however, that the packaging affects only how quickly the COM object is called, not how quickly its code executes. It makes sense to package your COM object in a DLL if it's going to be called often by client applications. In other words, if the act of calling the COM object takes up a significant percentage of the total amount of time required to call a particular method, it makes sense to package the object inside a DLL.

If your COM object must be robust, then it makes sense to package it in an .EXE file. An .EXE-based COM object executes within its own protected Win32 process space, whereas

an object that resides in a DLL executes within the process space of the calling application. Since an .EXE-based COM object does not have access to any memory that isn't in its own process space (although that's only partially true under Windows 95, it's entirely true under Windows NT), it is far less likely that a bug in your code will bring down your COM object's client application(s).

Finally, if your COM object must manage a shared in-memory resource, then the choice is up to you. An .EXE-based COM object is free

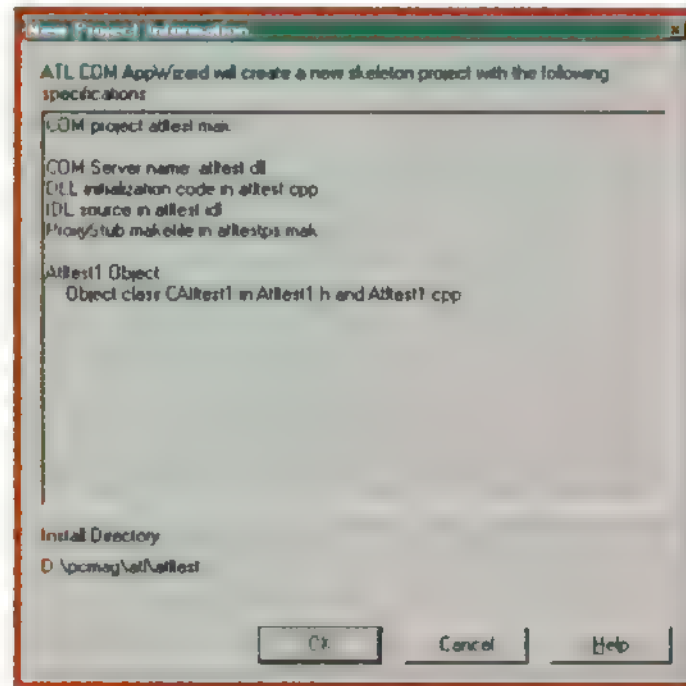


FIGURE 2: Summary of the files generated by the COM AppWizard.

to allocate memory in its own process space. On the other hand, memory allocated by a DLL-based COM object appears only in the process space of the calling application. To make a shared in-memory resource available to multiple client applications, a DLL must manage a block of global memory. That requires additional code on the part of the developer, not to mention learning the intricacies of memory-mapped files. In such a case, you would have to weigh the benefits of calling speed versus robustness.

WHAT KIND OF INTERFACE?

ATL provides you with a couple of choices regarding the kind of COM interface your COM object will export—custom or dual.

A custom COM interface derives from IUnknown. It is the fastest kind of interface you can create, and you're free to use any data types as arguments for your functions. If your COM interface will be called from client applications in another process space, MIDL will generate the marshaling code for you automatically. The combination of ATL and MIDL makes generating custom interfaces as simple as adding entries to your IDL file and your COM object's header file. (For an agonizingly detailed discussion of creating your own "remotable" COM interfaces, see *Inside OLE's* chapter on local/remote transparency.)

The other kind of COM interface is a dual interface, which derives from IDispatch, rather than IUnknown (although IDispatch is

itself derived from IUnknown). It provides a compromise solution, giving you the best of two worlds: A dual interface can be called from a wide variety of applications (such as those written in Visual Basic, which does not support pointers or class-based inheritance), and it has the performance inherent in a custom COM interface. (For a detailed discussion of dual interfaces, see "Dual Interfaces Using Delphi," November 5, 1996.)

The flexibility of a dual interface comes at a cost. The only parameter types you can pass in a dual interface are those deemed to be Automation-compatible. That means no pointers to user-defined structures, because the dual interface must be callable by standard Automation controllers, which understand only variant-compatible types.

CHOOSING BETWEEN ATL AND MFC

Whether you use ATL or MFC depends largely on the kind of COM object you're trying to build. In the strictest sense, a COM object is any object that implements the IUnknown interface. By that definition, ActiveX document servers and ActiveX controls really are just COM objects.

If you're interested in building ActiveX controls, don't hold off on using ATL. MFC implements all of the dozens of interfaces required for ActiveX controls. If you find the ActiveX controls generated by MFC are too large, you might want to examine the BaseCtl ActiveX control framework included with the ActiveX SDK. It allows you to build small, lightweight ActiveX controls without the overhead of MFC.

If you're interested in building ActiveX document-server applications that can be hosted inside Web browsers, such as Internet Explorer 3.0, don't use ATL. MFC's document/view architecture is uniquely suited to building document-centered applications, and it does much of the work for you.

If you're interested in building object-oriented code libraries for use by multiple applications, however, you can't beat ATL. If you would normally build a standard DLL or MFC Extension DLL, consider the small amount of extra effort required to build it using ATL. You get all the benefits of object-oriented code-sharing, plus the additional benefit that your code libraries can be used by applications written in virtually any Windows programming language. Furthermore, the applications don't even need to reside on your computer. With Microsoft's Distributed COM libraries now a reality under Windows NT 4.0, your COM objects are available to applications across your entire network—with no modifications necessary. □

John Lam is president of Naleco Research (www.naleco.com), developer of RADFind 96, a high-speed file-finder utility for Windows 95.

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PC Tech/Internet Tools

By Neil Randall

Directory Protocol on a Diet

LDAP is a slimmed-down protocol for X.500 directory access.

Finding information on the Internet is getting easier, but accessing information directories—sometimes called white pages—can still be a difficult proposition. The most common type of directory is the ubiquitous company directory, which offers information, such as phone numbers or e-mail addresses, about the people in an organization. Accessing these directories is becoming an especially acute problem as more and more information is moved to intranets, where fast and easy data retrieval is essential.

Solutions do exist. The most common protocol for directory management is X.500, and X.500 gateways to directory services are available across the Internet (*ldap.adelaide.edu.au:8888/M* is one example). But X.500's DAP (Directory Access Protocol) is problematic in three significant ways: First, and most importantly, X.500 is part of the protocol suite for OSI, the major ISO standard that is only partly compatible with the Internet's standard TCP/IP suite. And despite huge industry and government support, especially in Europe, OSI has so far failed to take hold. Second, X.500 server development has been rather slow, and existing servers are complex to administer. Finally, the X.500 data model is structured beyond the needs of most services, at least for the time being, and requires more processing than PCs or even some workstations can easily handle.

Enter LDAP, the Lightweight Directory Access Protocol (otherwise known as "X.500-lite"), designed to allow the best of X.500 directory services while surmounting their associated problems. Part of LDAP's design was to tone down a goal of X.500—standardizing all directory structures in one fell swoop—and allow developers to come up with multiple means of making information available, while still adopting the X.500 data structures. Of course, for the new protocol to be widely accepted, it had to use TCP/IP, and LDAP does that, too. Another design decision was to simplify DAP by leaving out some of

X.500's less-used features and by emulating others, thus reducing processing demands.

X.500 VS. LDAP

To understand how LDAP accomplishes its goals, it's necessary to know the basics of how X.500 works. The protocol is designed as a means of creating a global database made up of local databases, each of which holds part of the data. Users enter a local database by accessing a server through a local client, called a Directory User Agent (DUA). From the user's perspective, the entire database appears as if it's on just one server.

X.500 consists of five major components:

- the information model, which sets the form of the data;
- the functional model, which establishes the

given an object class (such as *person*, *organization*, *department*, and *network resource*), which determines the attributes allowed in the entry. Attributes can be anything the directory demands, but typically they include information distinctions such as *c* for country, *o* for organization, *sn* for surname, *ou* for organizational unit, and *cn* for common name. All entries are part of a hierarchical tree structure, and each is given a distinguished name (DN) that combines all attributes for the entry in hierarchical order. For example, the DN for the University of North Carolina in a particular directory might read "o=UNC c=US"—meaning the organization UNC is hierarchically beneath the country US. The DN for Joe Smith, who works in the Computer Services department at UNC, might read

"cn=Joe sn=Smith ou=Computer Services o=UNC c=US."

Several operations can be performed on X.500 directories by authenticated users: Search/Read, List, Modify, and Authenticate. *Search* picks out specified attributes and can be performed on the entire tree, on subtrees within the tree, or on individual entries. *Read* retrieves an entry and can contain referrals to other servers through the Directory System Protocol (DSP). *List* returns a listing of entries, *Modify* permits the adding, deleting, or altering of entries, and *Authenticate* lets an X.500 client identify itself to a server. Authentication takes place through a "bind" process to the server; this can be an anonymous authentication that lets you read the directories

only, or a password-protected authentication for making additions and modifications to particular DNs in the directory. The server administrator decides all levels of access, and if you're invited to contribute to the directory, you'll be given a user-changeable password for the entries for which you're responsible.

LDAP allows many of the same operations as X.500. Left out, however, are the Read and List operations, which instead are emulated through an expanded Search function. Modi-

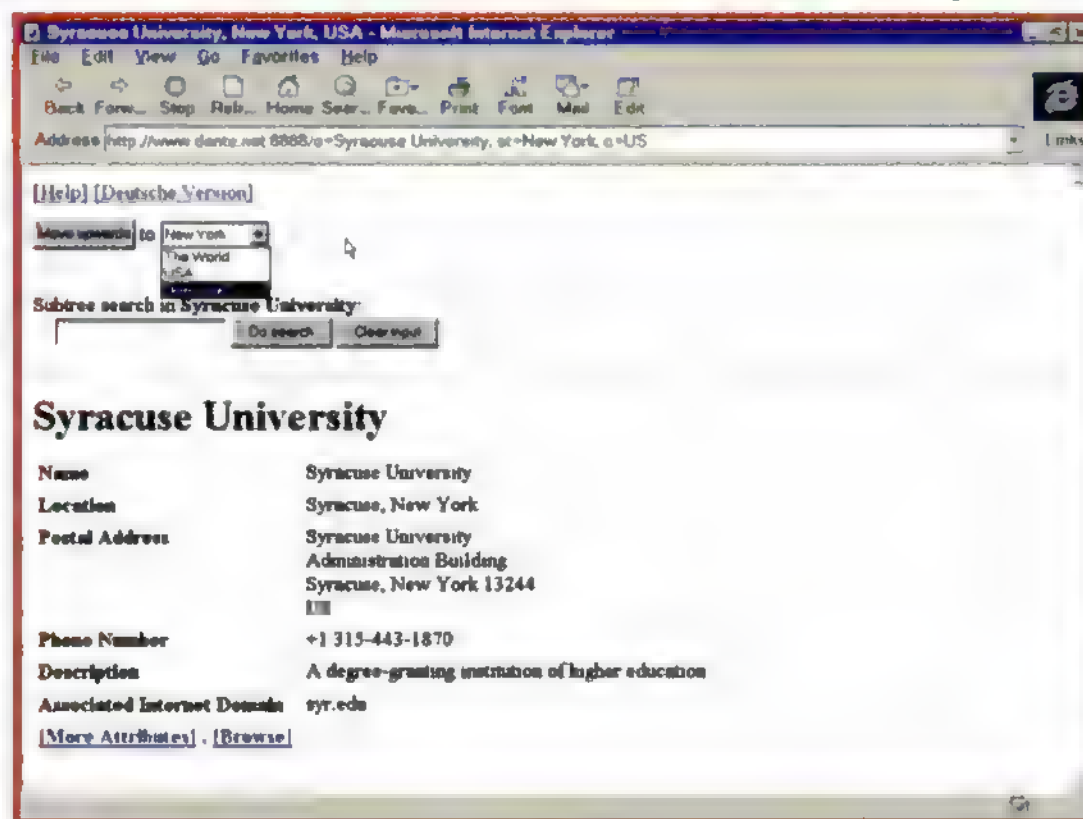


Figure 1: The Dante NameFLOW-Paradise directory shows LDAP in action. Each time you click on a country, the browser's URL field displays the attributes for that entry.

operations that can act on the data;

- the distribution model, which takes care of defining how those operations are carried out;
- the authentication framework, which allows for data security;
- and the name space, which contains information that makes it possible for data to be organized and referenced.

Within the information model, entries are composed of various attributes, each of which has a type and a class. Each entry is

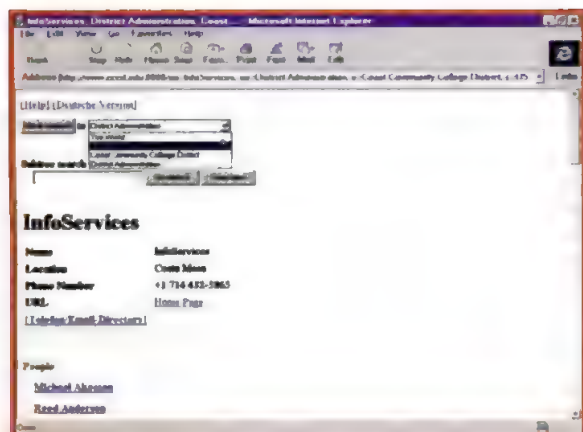


Figure 2: The InfoServices directory shows how Web-based entry modifications work.

fy lets you add, delete, or modify the value of an attribute. You can only act on an attribute itself indirectly. A request to add a value to an attribute that doesn't exist results in the creation of the attribute, and a request to delete the last remaining value in an attribute results in the attribute's deletion. What gives LDAP its power is that it's the server's job to make all this happen; basically, the server translates LDAP operations into X.500 operations on the fly, thereby simplifying the building and searching of directories.

There are other simplifications as well. Security in LDAP is significantly less robust than in DAP, because only unencrypted text passwords and Kerberos authentication are allowed. In the X.500 model, the client software chases after referrals, but in LDAP that becomes the server's task instead. Future versions of LDAP will probably add the possibility for client-side referrals in order to achieve full X.500 compatibility, but that would add some of the complexity that LDAP is trying to avoid. LDAP was initially based on the 1988 X.500 standard, and the Internet Engineering Task Force (IETF) is at work extending LDAP to incorporate various features included in the newer 1993 standard. Those additions will also increase LDAP's complexity.

To see an LDAP directory in action, go to the Dante NameFLOW-Paradise directory (www.dante.net:8888/). You'll arrive at the top level of the directory, The World; from there you can click on a country, and from the resulting page a locality or organization, and so on. Each time you click, the browser's URL field displays the attributes for that entry (see Figure 1). At any point, you can search within the subtree or move back up the directory structure. The data for the entries is usually maintained by the organizations participating in the directory, and different directories may thus have different types of information. Go to www.cccd.edu:8888/ to see an experimental example; you can

also see how Web-based entry modifications work (Figure 2).

Of course, what we all want to know is, How do the two compare in performance. Several charts, available at www.leland.stanford.edu/group/networking/directory/doc/ldap/6.perform.html, suggest that the LDAP slimming process has worked pretty much as expected. Searches take longer with LDAP than with DAP, but the queries are significantly smaller, as is the time spent in decoding and encoding the protocol elements. And the complexity of an LDAP implementation is much lower

than that of a typical DAP implementation. In other words, LDAP is leaner and meaner than its OSI counterpart—but at the expense of some functionality.

Like the Web's HTTP protocol (and just about everything else on the Internet), LDAP is based on a client-server model. Two examples of client software available for Microsoft Windows are Chromatix's CXDUA (www.chromatix.com/cxdua/cxdua.html) and waX.500 (shown in Figure 3) from the University of Michigan (www.umich.edu/~rsug/ldap/wax500). Web browsers can act as clients by using a Web-to-X.500 gateway. On some Web pages, in fact, you might find LDAP-based URLs such as ldap://ldap.id.umich.edu, but browsers don't yet recognize them (the URLs are used to provide LDAP server locations). As for servers, several are available, including lldapd, a front end for X.500, and slapd, a standalone server that concerns itself with LDAP requests only. (Information on both of these servers is available on the Web, at www.umich.edu/~rsug/ldap).

WHY THE SUDDEN IMPORTANCE?

The big news of the year for LDAP was a declaration of support from Netscape Communications. Since that announcement, the company has released Version 1.0 of its Directory Server (home.netscape.com/comprod/server_central/product/directory), which is based on the LDAP protocol. Other companies will certainly begin to build LDAP support into their products. Lotus has announced its Lotus Pages LDAP Server and has built LDAP awareness into its core products, cc:Mail and Notes. Novell

promises LDAP support for NetWare Directory Services (NDS) and for its GroupWise e-mail system. Banyan, which also announced LDAP support early in the game, is building it into the StreetTalk directory-service technology, as well as in Switchboard and Beyond-Mail for SMTP, all to be ready by the end of this year. In April of this year, Microsoft announced LDAP support in Exchange Server and Internet Explorer 4.0, and native support for LDAP in Windows NT Server's directory service past the current 4.0 release.

Netscape's Directory Server is arguably the most significant show of emerging LDAP strength to date. The company's white paper on the topic (home.netscape.com/newsref/ldap.html) explains why TCP/IP-based directory services are important for providing organized information and also shows the server's goals: a single interface for managing directory information, interoperability across platforms and software, the ability to scale upward easily to accommodate the inevitable expansion of data, and no proprietary ownership of the protocols. That important last point, of course, is the focus of all Internet development and one of the reasons X.500 faces a potentially rough ride, should LDAP close the technological gap. Like all OSI implementa-

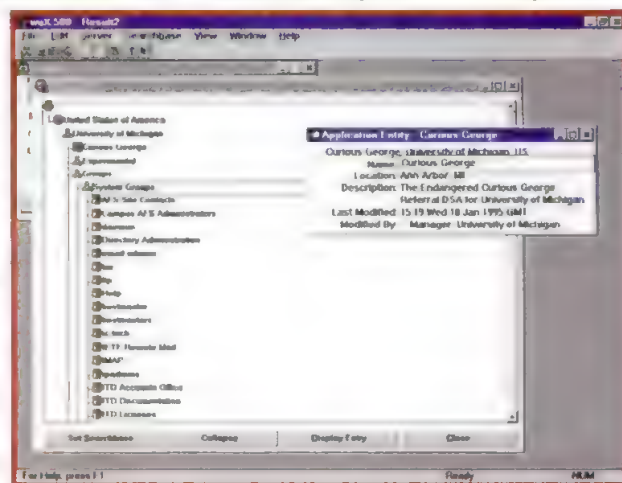


Figure 3: The waX.500 LDAP client software provides access to shared databases over the Internet.

tions, X.500 comes with a fairly lofty price tag.

LDAP's strength lies in easily allowing Internet and intranet users to access information contained in the many directories built by organizations that need to share that information. LDAP also makes it possible to build directory services that conform to standards, but not in an overly rigid way. And, of course, it rides on top of the Internet's protocols—an essential element in any information-giver's strategies. □

Neil Randall is the author of The Soul of the Internet, available in December from International Thomson Computer Publishing, and other books about the Internet.

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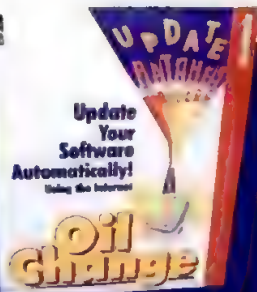
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By Michael J. Mefford

FDFiles: Find Dead Files

Find and delete unused files on your system.

Over time, old, unused files can accumulate on your system. These can be files from old applications you've upgraded or no longer use, or undeleted temporary files, to name a few possibilities. It would be nice to get rid of those old dead files, but figuring out what you still need and what you don't has never been easy—until now.

This issue's utility, FDFiles (Find Dead Files), makes it easy to find the files on your hard disk that haven't been accessed in a long time. FDFiles is a 32-bit Windows utility that works only under Windows 95 and Windows NT (Version 3.51 or higher). The file systems in these newer operating systems include a last-access-date stamp that is not available under DOS. In the DOS file system, a single date stamp is saved in a file's directory entry—the date when the file was last written to or saved. But some files, such as DLLs, are not normally saved when they are used, and the DOS system doesn't tell you anything about when such a file was last accessed. 32-bit file systems include two additional file-date stamps: creation and last access. The last-access-date stamp keeps track of when a file was last read and thus provides a means of detecting unused files. FDFiles uses the access date to help you find dead files and delete them from your system, freeing up valuable disk space.

You can obtain FDFiles by downloading it from PC Magazine Online. (Refer to the sidebar "Getting the Files" for details.) The source code for FDFiles, which was written with Delphi 2.0, Borland's visual programming tool, is provided for those interested in seeing how it works.

USING FDFILES

To install FDFiles, copy the program files FDFiles.exe and FDFiles.hlp to a subdirectory on your hard disk and create an icon for

FDFiles in your shell. When you launch FDFiles, you'll see a tree view of your computer's directory on the left and two list pages on the right. The Search Spec page lets you set search criteria and specify the directories to search; the Files Found page displays the search results.

The directory tree looks and operates much like Explorer's directory tree. You can refresh a highlighted branch on the directory tree by selecting File | Refresh. This is useful if you change floppy disks or create a new directory. The directory tree can be used as a drag-and-drop source for the directory list on the Search Spec page or as a copy/move target for

IN THIS ISSUE

FDFiles

FDFiles finds files that have not been accessed recently and helps you remove them from your system.



the files listed on the Files Found page. A splitter bar between the directory tree and the page lists lets you control the space allotted to each side of the display.

To start a search, you must specify one or more directories by dragging a directory from the Search directory tree and dropping it on the Search Spec page, or by selecting a directory in the tree and then clicking on the Add button. If you want to search the root directory of a particular drive (and,

optionally, its subdirectories), drag the drive letter to the Search Spec page. If you want to search a particular subdirectory, expand the drive tree by clicking on the plus sign to the left of the drive, double-clicking on the drive icon or letter, or navigating with the arrow keys to the desired subdirectory and hitting Enter. Continue expanding until the desired subdirectory path is visible and then add the path to the Search Spec page by dragging it or clicking on the Add button. You can add as many paths to the Search Spec page as you like.

The next step is to specify what you want to find in the selected directories by modifying the parameters in the top line of the Search Spec page. This top line reads like a sentence; for example: "Find *.* where Last Access is <= Sep 19, 1996" (see Figure 1). The first parameter is the Find filespec. It defaults to *.* which instructs FDFiles to look for files of any type in the directories you selected. You can narrow the search to only DLLs, for example, by changing the filespec to read *.DLL.

The second parameter lets you select from the three available date stamps. The default is last access, which will find files according to the last-access date—the best choice for finding unused files. You can also select creation date or last write date. The creation date never changes, and the last write date should never change for nondata files like DLLs; those dates are less useful as criteria for finding unused files.

The third parameter lets you select whether to search for files with dates before (< or <=), after (> or >=), or equal to (=) the date stamp, or to search without regard for the date stamp (All).

The last parameter, the date button, lets you select the date. When you click on the button, a calendar appears from which you

FOR PROGRAMMERS ONLY FDFiles goes a long way toward emulating Explorer's use of the TreeView control, which was introduced with Windows 95. The full source code for FDFiles, along with an expanded article that discusses the programming techniques used in the utility, can be found on PC Magazine's World Wide Web site (www.pcmag.com).

FDFiles demonstrates

- how to populate a TreeView with drive and directory information;
- how to obtain the small icon symbols used by Explorer;

- how to emulate Explorer's use of the plus and minus symbols.

Support for the free utilities offered by PC Magazine can be obtained electronically in the Utilities section of 2D Net's TIPS Forum (GO ZNT:TIPS). The authors of current utilities generally visit this forum every day. You may find an answer to your question simply by reading the messages already posted in the forum. If the author is not available and the forum sysops can't answer your question, the Utilities column editor, who also checks this forum each day, will contact the author for you.

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make your selection. (If you have selected All dates with the third parameter, the date button is disabled.)

The Search Spec page has two check boxes. If you check the Include Subdirectories box, FDFiles will search the selected directories plus any subdirectories beneath them. To search an entire disk, drag the drive letter to the Search Spec page and check Include Sub-

removed from the list. The Clear button clears the list box, so you can start over. When you are done specifying your parameters, click on the Search button to start the search.

FILES FOUND

When you click on the Search button, FDFiles automatically switches to the Files Found page and starts filling it with filenames that match the criteria of the Search Spec. You can sort the list by clicking on the column header buttons: Name, Creation, Last Access, or Last Write. A second consecutive click on the same button sorts the list in descending order. You can size the columns by dragging the left or right edge of the header button above it.

FDFiles also lets you manage the files found in the search. If you're looking for unused files, you will probably want to delete some or all of them. Just select the files and then click the Delete button. A dialog box will tell you which file will be deleted (or how many files, if there are more than one) and ask you to confirm your choice.

If you are unsure whether the files are really unneeded, archive them by moving them to a temporary directory instead of deleting them right away. If your system continues to work properly, you can delete them later. To copy or move files, select the ones you want, then drag them to the desired location in the directory tree. When you drop the files on the destination directory, a pop-up menu allows you to choose whether to copy or move the files to the destination (you can also cancel). If you choose to continue, the pop-up menu will be followed by a confirmation dialog box telling you exactly which file is going to be copied or moved (or how many files, if there are more than one), and to where.

You can also copy and move files via the Windows Explorer-style copy-and-paste technique. After selecting the desired files, click on the Copy button to copy their names. Next, select a destination in the directory tree and click on the Paste button. The Copy or Move pop-up menu will appear, just as it does when you use drag-and-drop. Although Explorer doesn't use a confirmation dialog box, I do. FDFiles tells you what's going to happen and gives you a chance to change your mind.

Like Explorer, FDFiles lets you rename files using in-place editing. To shift into edit mode, select a filename, wait a moment, then click on it again, or, click on the Rename button. To save the name after changing it, press Enter; to cancel the change, press Esc. Like the buttons on the Search Spec page, the buttons on the Find Files page (except for the Paste button) are drag-and-drop-aware, so you can drop a filename onto the Rename button, for example, to activate in-place editing. Both the Files Found page and the destination directory tree have right-click context menus from which you can quickly access file functions.

So that you don't have to reenter frequently used settings, FDFiles remembers the position and size of the FDFiles window, your Search Spec page specifications, and any column-sizing changes you may have made to the Files Found page. Each time you launch FDFiles, it will recall the last settings you used.

IN CLOSING

The Last File Access date in the Windows 95 and Windows NT file systems is handy to have, but it's not of much use if you don't look at it. FDFiles gives you an easy way to take advantage of this feature of 32-bit Windows operating systems. □

Michael J. Mefford is a contributing editor of PC Magazine.

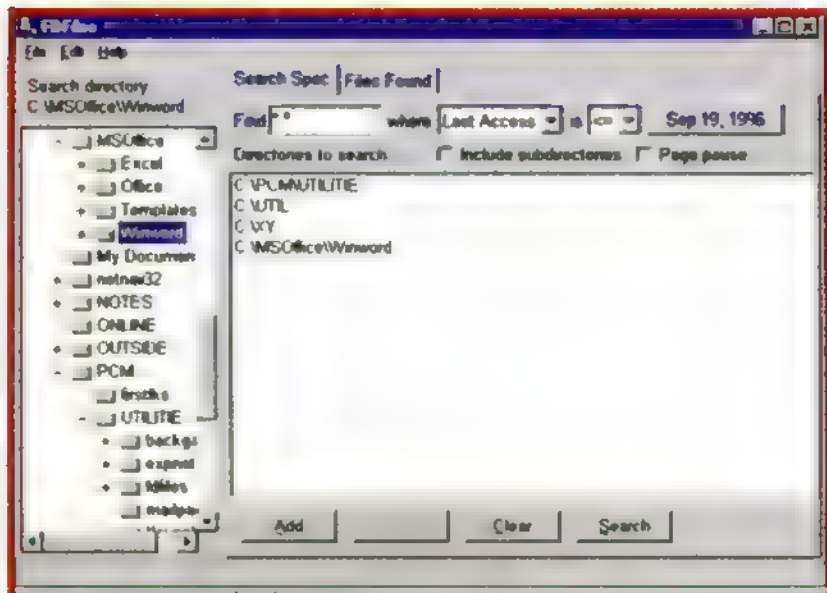


FIGURE 1: The Search Spec page in FDFiles is where you set your search parameters.

directories. If you check the Page Pause box, FDFiles will pause each time it fills the File Found page with filenames, giving you a chance to decide if you want to continue or to abort the search.

There are also some buttons at the bottom of the page. I've already mentioned the Add button; it's drag-and-drop-aware, so you can drag a path from the directory tree and drop it onto the Add button to add it to the list. You can use the Remove button to remove selected directories from the search criteria, in case you've added one in error. Optionally, you can drag a directory from the list and drop it onto the Remove button or the directory tree to remove it from the list. Don't worry—nothing actually happens to the files when you drop them; their names are merely

GETTING THE FILES



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BY FAX OR MAIL If you don't have a modem or Internet access, you can fax 508-368-0141 or write to PC Magazine Utilities, c/o Image Software Services, 55 Green St., Clinton, MA 01510-3099.

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PC Solutions

TIPS AND TECHNIQUES TO INCREASE YOUR PRODUCTIVITY

User-to-User

By Neil J. Rubenking

Auto-Start a Recorder Macro

I'm still using DOS and Windows 3.1, and I wanted to find a way to execute certain commands automatically after start-up. Specifically, I wanted to start Windows and run an AOL FlashSession. If I hadn't received any e-mail, I wanted to exit from AOL and Windows back to DOS, but if e-mail messages had been downloaded, I wanted to remain in Windows, with AOL up but off-line.

Using the Windows Recorder utility, I was able to create a macro called RUNAOL.REC that did what I wanted. From DOS, I could give the command `WIN RECORDER.EXE RUNAOL.REC`, and the computer would load first Windows, then Recorder, and then the macro file. The only problem was I hadn't yet found a way to tell Recorder to go ahead and execute the macro file. Recorder just sat there stupidly in a window, waiting for me to tell it to run via keyboard or mouse input. When I told it `RUN`, Recorder executed the macro perfectly, loading AOL and executing a FlashSession without any additional input on my part.

I then found out about an undocumented switch for Recorder that permits execution of Recorder macros without user interaction, and it works! I can now invoke

```
WIN RECORDER D:\WINDOWS\RUNAOL.REC -h  
-^F10
```

either from the DOS command line or at the end of my `AUTOEXEC.BAT` file, and the computer will load Windows and Recorder, then execute a session that logs on to AOL, sends and receives any e-mail messages, and logs off of AOL—all while I am setting up my morning coffee. Now I just need to set the macro up so it retrieves my morning Dilbert cartoon as well!

ED UNGER
Houston, Texas

PC MAGAZINE: Microsoft's Windows 3.x knowledge base (article Q72439) refers to the `-h` command line parameter for Recorder as "undocumented and unsupported" and states that Microsoft "does not support or encourage the use of this parameter." But the article

presents no specific reasons for discouraging use of the `-h` parameter; this parameter, in fact, extends the usefulness of Recorder macros substantially.

Remember that when recording user activity with Recorder, it's always best to use the keyboard rather than the mouse. Keystrokes are unambiguous, while a mouse-click's meaning can change if the window involved has a different size or position at playback time. This rule applies all the more when preparing a macro that you intend to execute automatically using the `-h` switch. If you find yourself recording a macro again and again to get the keystrokes just right, consider using our `RECEDIT` utility, which permits direct editing of Recorder macros. You can download `RECEDIT` from PC Magazine Online. (For details, refer to the sidebar "Getting the Files" in this issue's Utilities column.)

The value following the `-h` parameter is an encoding of the macro's hotkey, not the macro's name. It appears that only single-word hotkey names can be activated from the command line; two-word names, such as "Page Down," don't work. The key name can be prefixed with up to three characters representing shift keys: `%` for Alt, `^` for Ctrl, and `+` for Shift. The reader's example uses the string `^F10`, meaning that the desired macro is associated with the keystroke Ctrl-F10.

Cleaning Up the Run Command's List

If you use the Windows 95 Run command a lot, after a while you may find it has become cluttered with a bunch of commands you no longer need. Here's how to clean up the list using the Windows 95 Registry Editor (you may want to make a copy of the files `USER.DAT` and `SYSTEM.DAT` just in case something goes wrong): Run `REGEDIT.EXE` to edit the contents of the Registry. Go to the key `HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Explorer\RunMRU`. In the right-hand panel, you'll find a list of your most recently used commands—just delete the ones you don't want any more. You can do this by right-clicking on the letter of the value you want to delete and then selecting `Delete` from the

HIGHLIGHTS



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DATABASES How to replace the splash screen that is displayed when Paradox for Windows starts up with one of your own. Page 276.

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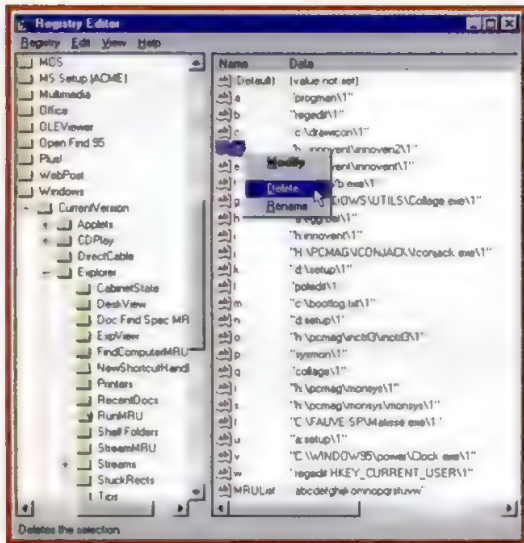


FIGURE 1: One way to remove unwanted items from the Run menu item's most recently used list is to edit the Registry and delete them directly.

menu (Figure 1). One word of caution: Be careful not to delete the Default value or the MRUList value.

OMAR ESQUIVEL
via the Internet

PC MAGAZINE: The Run command on the Start menu lets you run any program by typing in its name and any necessary command line parameters. The commands you run in this way are stored in the Registry, and each time you use a command that's already stored, it moves to the top of the list. When the list gets too full, items are removed from the end. Thus, the most recently used items stay on the list.

The phrase "most recently," however, is relative—it doesn't necessarily mean "not long ago." If you don't use the Run command

much, the list can contain items dating back to the installation of Windows 95. And the list can include commands with erroneous parameters, or even powerful system commands you wouldn't want to repeat accidentally. Cleaning up the MRU list every so often is an excellent idea.

Editing the Registry directly is a somewhat alarming practice, since an error could conceivably damage your Windows 95 configuration. The file shown in Figure 2 cleans out the entire MRU list using a safer approach. Download the file 9RUNLIST.REG, or type it in carefully as a file with the extension .REG. Double-click the file in Explorer to launch it; you'll get a message that the file's contents have been merged into the Registry. Now restart Windows so that your change can take effect. The next time you select Run from the Start menu, you'll find that all of the items in the list of recently used commands have been removed.

Long Filenames Revisited

I believe an item in your issue of March 26, 1996, didn't correctly describe how Windows 95 handles long filenames or how long filenames correspond to their short-name equivalents.

The item indicated that when you create a long filename, Windows 95 will use the tilde format only when the truncated version of the name isn't unique. I've found this not to be the case. I created a file in the Windows 95 version of Notepad with the unique name c:\zztesttest.txt. (No other files beginning with z existed in this directory.) According to your article, the short filename should have been c:\zztest.txt because the filename is unique. Instead, it appeared in the all-too-familiar tilde format: c:\zztest~1.txt.

Even if I create a file—Test.doc, say—and then rename it to the longer name LongFileTest.doc, Windows 95 still uses the tilde format to display the short name. The actual conditions when Windows 95 will not use a tilde are a little strange: If you create a file that follows the 8.3 format (Windows, of course, will not use a tilde), and you then rename the file with a long name, the file will retain the same short name—as long as you don't change the beginning of the filename, and as long as you don't put a second period into the filename.

For example, if I rename Test.doc to Test.doc_My Christmas Wish List, the short filename will still be Test.doc. But

if I rename it Wish.doc_My Christmas Wish List, the short name changes to Wish~1.doc. The only way to get rid of the tilde now is to rename the file to a standard 8.3 filename.

RICK BYERS
Welland, Ontario, Canada.

PC MAGAZINE: The earlier article on long filenames did indeed give the wrong impression about Windows 95's behavior. If you create a new file with a name that does not fit the old-style 8.3 filenames convention, Windows 95 will generate an alternate 8.3 name for it and will indeed replace the last two (or more) characters of the filename portion with a tilde and a number. More specifically, Windows 95 starts with the first six characters of the filename, omitting spaces and replacing certain punctuation characters with underscores. Then it appends a tilde and the digit 1. If there's already a file in the current directory using this alternate name, Windows 95 tries 2, then 3, and so on. If all the digits from 1 to 9 produce filenames that already exist, Windows 95 uses the first five characters of the name, followed by a tilde and the first two-digit number that produces a unique filename.

As this reader noted, creating a long filename whose alternate 8.3 filename does not end in a tilde and a number is a two-step process. First, you must create your file using an 8.3 filename. Then you must rename it without changing the first 8 characters of the filename portion. In addition, you should not append text to the extension, as this will effectively change the file's type, breaking its associations. Thus, the best way to create such a filename is to start with an 8.3 filename whose name portion is a full eight characters, and then to rename it to a long filename that adds text to the filename portion.

To see this process in action, enter this series of commands at a DOS prompt under Windows 95:

```
ECHO X > LONGNAME.TXT
ECHO X > NAMELONG.TXT
REN LONGNAME.TXT "LONGNAME_This is
=long.TXT"
REN NAMELONG.TXT "NAMELONG.TXT_This is
=long"
DIR *.TXT
```

The DIR command will show both files, with their original 8.3 filenames in the left column and their long names in the far right column. Now enter the commands

```
START LONGNAME.TXT
START NAMELONG.TXT
```

The first file is automatically loaded into Notepad, as expected. The second, the one whose extension was changed, is not—its association with Notepad has been broken.

REGEDIT4

```
[HKEY_CURRENT_USER\Software\Microsoft\
Windows\CurrentVersion\Explorer\RunMRU]
"a"=""
"MRUList"="abcdefghijklmnopqrstuvwxyz"
"b"=""
"c"=""
"d"=""
"e"=""
"f"=""
"g"=""
"h"=""
"i"=""
"j"=""
"k"=""
"l"=""
"m"=""
"n"=""
"o"=""
"p"=""
"q"=""
"r"=""
"s"=""
"t"=""
"u"=""
"v"=""
"w"=""
"x"=""
"y"=""
"z"=""
```



FIGURE 2: Launch this file in Explorer to clear the Run menu item's list of most recently used commands.

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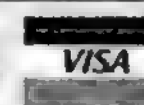
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12/17/96 PC Mag

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HARDWARE

Brain Transplant



I have a 486DX2/66 system with 12MB of memory and a 128K cache. I'd like to upgrade the CPU to get better performance. What processor will provide the best boost for my system?

TIHOMIR TOCHEV
Bristol, Virginia

PC MAGAZINE: The 486DX2/66 is still a useful configuration, though it is a bit underpowered for some of the latest applications, including Windows 95. Depending on your motherboard's configuration, you may be able to extend the useful life of the system by upgrading the CPU.

The most important factor is whether your motherboard has local bus expansion slots. For a 486-class system, these should be VL-Bus slots. The advantage of local bus slots is that they provide 32-bit data transfer at the same speed as the system clock (33 MHz, in this case), compared with the 16-bit, 8-MHz data-transfer rate of the standard ISA expansion bus.

If your system does not have local bus slots, it makes little sense to upgrade the CPU, as the added processing power would not have much impact on your system's performance.

If your system does have VL-Bus slots, then your best bet is to stick with the 486 family of processors and go for a DX4-100. This processor has the same 33-MHz external system clock speed, so it is compatible with the VL-Bus standard and should be a simple plug-in replacement for your current processor. (Make sure you get the 5-volt version.) This upgrade will increase the internal calculation performance of the CPU by 50 percent and should provide an inexpensive yet noticeable performance boost. This solution is probably the end of the line for 486 systems.

If, on the other hand, you want to move up to a Pentium processor, you should probably replace the entire motherboard. One reason is that the Pentium works better with the PCI local bus than with the VL-Bus. You'll need to get new expansion cards to go along with the new motherboard to replace any VL-Bus cards you may have, which will increase the expense of this upgrade. But this approach

will provide you a better upgrade path to faster Pentium CPUs in the future, so it may be the smarter choice for the long run.

—Alfred Poor

Ditch That Disk

I'm planning to upgrade my 286 system with a new motherboard and processor, and I'd like to reuse as many of the existing components as possible. In particular, I'd like to use my 20MB MFM hard disk as temporary storage where I can put files I've downloaded from the Internet until I've had a chance to check them for viruses. Can I use the old ISA controller card and have it coexist with the IDE controller that is built into my new motherboard?

PAUL WILLIS
Columbus, Ohio

PC MAGAZINE: Your MFM drive is so small and so slow, it's not worth putting too much effort into this project. But since you own the disk already, you may as well give it a shot.

The short answer is that the MFM and IDE drives should indeed be able to coexist, and your IDE drive should show up as your boot drive. The only problem would be if the ROM on the MFM controller is mapped to the same high memory location as some other compo-

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INDEX

SYSTEMS

CompUSA Direct	265
COMPUTER DISCOUNT	
WAREHOUSE	252
Comtrade	262
FOSA	261
HARTFORD COMPUTER	
GROUP	277
INSIGHT DIRECT, INC.	282
Leap Frog Computers	298
MicroWarehouse	296
Magix	257
MIDWEST COMPUTER	
WORKS	274
NECX	271
PCs Compleat	286
USA Flex	280

SOFTWARE/PERIPHERALS/ COMPONENTS

ARLINGTON COMPUTER	
PRODUCTS	292
BULLDOG	273
COMPUTER DISCOUNT	
WAREHOUSE	252
First Source International	295
H. Co./Micro Mall	291
INSIGHT DIRECT, INC.	282
LA Trade	272
MEGAHAUS	258
Micro Solutions	270,294
MIDWEST COMPUTER WORKS ..	274
PC Connection	284
SPSS, Inc.	281

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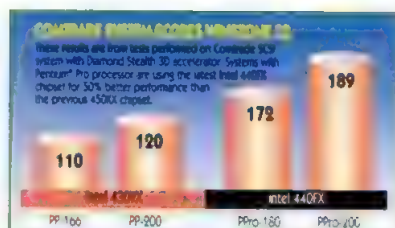
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nent in your system—the graphics adapter is one potential conflict. You may not be able to reconfigure the address for the MFM controller. If that's the case, and you can't change the address of any other conflicting device, you're probably out of luck.

The best bet is simply to plug in the MFM drive and see what happens. If it doesn't work, paying \$150 for another IDE drive will probably get you about 25 times as much storage as you would from your old drive.—*Alfred Poor*

L2-Cache Specifications

I just upgraded my system with a new Pentium motherboard, but I'm puzzled about what to use for the L2 SRAM cache for this setup. The cache slot conforms to the COAST (Cache On A STick) specification, and I am currently using a 100-MHz Pentium (although I do intend to upgrade to a 133-MHz CPU in the future).

RECOMMENDED SPEEDS FOR L2-CACHE COMPONENTS

Cache type and speed	SRAM speed	Tag SRAM speed
Asynchronous, 50 MHz	20 ns	17 ns
Asynchronous, 60 MHz	17 ns	10 ns
Asynchronous, 66 MHz	15 ns	7 ns
Burst, 50 MHz	20 ns	20 ns
Burst, 60 MHz	16.66 ns	15 ns
Burst, 66 MHz	15 ns	15 ns

Source: "COAST 1.2: Flexible Cache Solution for the 82430FX PCSet, Rev. 1.2," Intel Corp., www.cs.intel.com/oem_developer/chipsets/pci/82430fx/7573.htm.

I thought I had read somewhere that pipeline-burst SRAM should be rated at about 8.5 nanoseconds (ns). Most of the stores in my area are providing COAST modules rated at 14 or 15 ns, and while these appear to work in my system, I haven't actually purchased one, because I'm wondering if I should use a faster module. Can you shed any light on this problem?

RANDOLPH L. SCHMIDT
Mountain View, California

PC MAGAZINE: There are two components to the L2 system cache in a computer system: the cache RAM itself and the Tag SRAM. The rated speeds you'll need for these two different components will depend on how you have your L2 cache configured. To be absolutely certain, get the specification directly from your motherboard manufacturer. In general, the information in the above table from the COAST, Version 1.2, specification can be used as a guideline.

Your 100-MHz Pentium uses a system clock speed of 60 MHz, so 17-ns SRAM modules should suffice for that processor. The Tag SRAM should be either 10 or 15 ns, depend-

ing on whether you configure the L2 cache as asynchronous or burst. If you're planning to upgrade to a 133-MHz Pentium (which uses a 66-MHz system clock speed, as do the 166- and 200-MHz Pentiums), you'll want to use 15-ns modules for the cache SRAM and 7 or 15 ns for the Tag SRAM.

Note that some motherboards may come with some L2-cache SRAM already soldered in place on the motherboard, and even though there is a COAST-compatible socket present, you cannot add memory to the cache. Again, check with the motherboard manufacturer for details on your system's specifications.

You also might be able to find the specifications for your motherboard online. For example, Intel motherboards are popular for Pentium systems and the company posts many technical details on the Web. You can even

find some complete technical manuals in Adobe Acrobat format, complete with board diagrams and pinout details. Look for the Intel information at www.cs.intel.com/oem_developer/motherbd/.—*Alfred Poor*

OPERATING ENVIRONMENTS

Changing Icons in Windows 95



I really like Windows 95, but I have one question about it: Can you change an icon? If you can, how? Are there utilities that can help? I've tried the Windows help files but they seem to be of no help at all in this regard.

TIM HERRERA
Penn Valley, California

PC MAGAZINE: Virtually all icons in Windows 95 can be changed, but the method depends on what the icon represents. Shortcuts you've placed on the Desktop are the easiest to modify. Simply right-click the shortcut, select Properties, click the Shortcut tab (or the Pro-

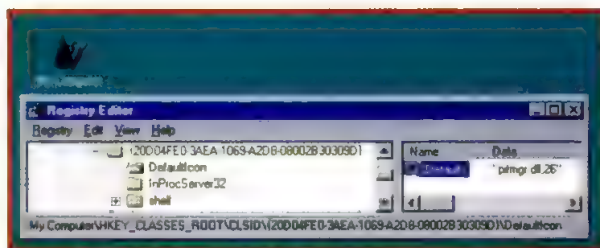


FIGURE 1: To change the icon for system elements on the desktop, you must use the Registry Editor.

gram tab, if it's a DOS program), and press the Change Icon button. You'll be presented with a dialog that shows the name of the file containing the current icon and a list of the other icons in that file. Pick a new icon from the list, or choose an icon from a different .EXE, .DLL, or .ICO file. Pifmgr.dll and Shell32.dll, both found in the System directory, contain quite a few icons.

To change the icon for a Start menu item, right-click the Start menu button, choose Explore, then navigate to the menu that contains the item. Menu items are shortcuts too, so right-click the item, select Properties, and proceed as you did for the desktop shortcut.

When you view files in Explorer, each has an icon to its left. Program files use their own icons, and you can only change them with a resource editing tool, such as Borland's Resource Workshop. But you can change the icon used to represent all files of a particular registered type. Select Options from Explorer's View menu and click the File Types tab. From the list, pick the file type you want to change and click the Edit button. Now press the Change Icon button and choose an icon just as you did for the shortcuts.

Some desktop icons, such as My Computer and Recycle Bin, represent system elements rather than shortcuts. Installing a theme from the Windows 95 Plus! pack will assign new icons to these elements; changing them by hand is a bit more difficult. Start by bringing up the Change Icon dialog for any shortcut and browsing for the icon you want to use. Determine the icon's number within the file by clicking on the icon and then counting the number of left-arrow presses it takes to reach icon number 0, the first icon. Now press Cancel, since you don't actually want to change this shortcut. Select Run from the Start menu and run RegEdit, the Registry Editor. Press Ctrl-F and seek the name of the item—My Computer, for example—whose icon you want to change.

The found item will be displayed in RegEdit's right-hand pane, and the folder icon next to the corresponding key in the left-hand pane will be open. The key name should be a horrendous string of characters, something like {20D04FE0-3AEA-1069-A2D8-08002B30309D}.

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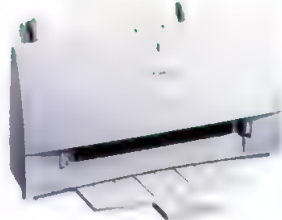
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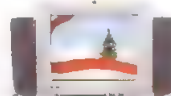
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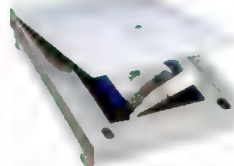
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Click the plus sign to the left of the key to open it and you'll see a subkey named DefaultIcon (shown in Figure 1). Click on DefaultIcon, double-click on the word (Default) in the right-hand pane, and enter the filename and number for the new icon. System icon changes will take effect as soon as you restart Windows.

—Neil J. Rubenking

WORD PROCESSING

Tracking Changes to Paragraphs in Word



In some kinds of technical writing, it's important to track changes on a paragraph-by-paragraph basis. Specifically, it would be useful to add a small time stamp (with the date) in the margin next to each newly created or edited paragraph and also maintain a location-oriented, time-stamped archive of deleted and revised sections or paragraphs.

It would also be helpful to print a completed version of the document or copy it to another file, with a release number and final time stamp in the header, but without all of the interim time stamps in the margins. Is there a third-party program that can provide all of these features for Microsoft Word?

PAUL R. FINGER
Cocoa Beach, Florida

PC MAGAZINE: If there is such a program, I've never seen it. But that may be because Word 6.0 and 7.0 can jump through all these hoops on their own—if you combine styles, macros, and the annotation feature, that is. Unfortunately, I don't have enough room here to provide a complete turnkey solution, but I can give you the major pieces and map out the other steps you may want to take.

First, you'll need to create a style for the time stamp, which we'll call TimeAndDateStamp. To create the style, choose Format | Style, then the New button. Enter TimeAndDateStamp in the Name text box. Choose the Format button, then Font, and set the font and font size. (You may want to experiment with this a bit, but note that the rest of the settings used here are based on choosing Courier New for the font and 8 points for the font size.) You should be able to accept the defaults for the rest of the Font choices. Now choose OK to return to the New Style dialog box, and then choose Format | Border to open the Paragraph Borders and Shading dialog box. Make sure the border is set to None, and choose OK to return to the New Style dialog box.

Next, choose Format | Frame. Set Text Wrapping to Around. In the Size box, set Width to Exactly, At 0.6 inches, and set Height to Exactly, At 0.23 inches. In the Hor-

izontal box, set Position to 0.3 inches, Relative To Page, and set Distance from Text to 0.13 inches. In the Vertical box, set Position to 0.05 inches, Relative To Paragraph, set Distance from Text to 0.13 inches, and make sure that the Move with Text and Lock Anchor text boxes are both checked. (Note that if you've used a different font or font size than I suggested, you may have to modify some of these settings.) Finally, choose OK to close the Frame dialog box, OK again to close the New Style dialog box, and then Close to close the Style dialog box.

The style you've just created lives in the document from which you started. You'll have to move it to the template you want to use with your technical writing documents. We'll assume you want to add it to your Normal template so that it will be available for all your documents. Choose File | Templates, then the Organizer button to open the Organizer dialog box.

Choose the Styles tab to go to the Styles card, which should show you the list of styles in the current document on one side and the list of styles in Normal.dot on the other. Highlight the TimeAndDateStamp style in the document style list and choose Copy to copy it to Normal.dot. Then choose Close to return to the document. This is a good time to choose File | Save All to save the new style to disk.

Once you've created the style, you can create a macro to insert the time stamp and format it with the TimeAndDateStamp style. (To create the macro, choose Tools | Macro, enter a name for the macro, and choose Create.) Figure 2 shows the macro I devised. Briefly, the macro first inserts a frame, then formats the blank paragraph within the frame with the TimeAndDateStamp style. The macro inserts the date and time using the InsertDateTime command, then moves one character right to take the cursor back to the beginning of the paragraph. Save this macro as TimeAndDateStampByParagraph.

To use this macro, place the cursor anywhere within the paragraph you want to be time-stamped and run the macro. For maximum convenience, you should take advantage of the Tools | Customize command to attach the macro to a toolbar button, menu command, or keystroke combination.

Creating an archive of modified paragraphs is a little trickier. Figure 3 shows a macro that will do the deed. This macro first selects the current paragraph and the one preceding it (which should be a time stamp), then copies the selection to the Clipboard, inserts an annotation, and pastes the copied text into the annotation pane. Next, the macro returns to the document pane, selects the old time stamp, and deletes it with Edit | Clear. Finally,

it runs the TimeAndDateStampByParagraph macro to enter a new time stamp. This archive macro leaves the annotation pane open by design, letting you confirm that it did what it was supposed to do. You can close the pane with Alt-Shift-C.

To run this macro, place the cursor in the paragraph you're about to edit and give the command to run the macro. Here again, for

```
Sub MAIN
  InsertFrame
  Style "TimeAndDateStamp"
  CharLeft
  InsertDateTime .DateTimePic = "MM/dd/yy h:mm
  ➔AM/PM", .InsertAsField = 0
  CharRight 1
End Sub
```

FIGURE 2: This macro will insert a time-and-date stamp in the margin next to a paragraph.

maximum convenience, you should attach it to a menu, toolbar button, or keystroke combination. (You'll find both of these macros on PC Magazine Online in the file TIMEDAY.ZIP.)

Be aware that depending on whether the annotation pane is open or closed, the references to the annotations may be added to either the beginning or the end of the string of annotation references for any given paragraph. Since each annotation is time-stamped, however, it shouldn't be difficult to rearrange them if necessary.

Finally, to print the file without the time-and-date stamps in the margins, you can redefine the style to use hidden text, or you can use the Edit | Replace command to search for the TimeAndDateStamp style and then delete the text. If you like, you can record either or both of these procedures in a macro to automate the task. You can also record a macro to add a time stamp to the header when you're ready to print out the final version of a document.—M. David Stone

```
Sub MAIN
  ParaDown 1
  CharLeft 1
  ParaUp 2, 1
  EditCopy
  InsertAnnotation
  EditPaste
  OtherPane
  ParaUp 1
  ParaUp 1, 1
  EditClear
  ToolsMacro .Name =
  ➔"TimeAndDateStampByParagraph", .Run
End Sub
```

FIGURE 3: This macro will archive paragraphs as annotations and will add a new time stamp to the paragraph you're about to modify.



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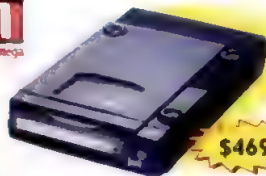
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SPREADSHEETS

Making the YTD Function Automatically Recalc in Excel



In your issue of June 11, 1996, you described a custom Excel function named YTD. This function is designed to provide a year-to-date calculation based on the summing of a particular cell in consecutive worksheets in an Excel 5.0 workbook. I entered the function in Excel and encountered three problems I'm hoping you can help me understand.

When you let Excel insert the Macro module for you, it inserts the module ahead of Worksheet1 in the workbook. If you leave it that way, your YTD calculation in Worksheet1 is too large by a multiple of the monthly number in Worksheet1.

No matter how many worksheets the workbook contains, the last (and only the last) always shows a #VALUE! indication in the cell with the YTD function. I tried the function with 16, 18, and 20 worksheets, and as soon as I added an additional worksheet at the end of the workbook, the #VALUE! error disappeared and the calculated value appeared. The #VALUE! error reappeared in the YTD cell in the "new" last worksheet.

The YTD function does not seem to operate in an auto-recalculation mode. If I change the value of the monthly figure in the first worksheet (Jan., for instance), the changed YTD numbers should ripple through all of the succeeding worksheets, but they don't. Even pressing F9 had no effect. I needed to go into each worksheet, select the YTD cell, go into the formula bar, and hit the Enter key (without changing the YTD formula). Only then did the changed YTD value appear. This would seem to defeat the purpose of a self-calculating YTD function, so I'm hoping you can explain if I'm doing something incorrectly or, if not, how YTD can be modified to operate in auto-recalc mode.

I'd like to use this function to maintain softball statistics. I want to store each game's stats, by player, in a separate worksheet, and have the last worksheet show cumulative season statistics (for example, At Bats, Runs, RBIs, and so forth). Although I can work around the first two problems by moving the Macro module to the end of the workbook, the third is a show-stopper for me. YTD is a really handy function, so I hope you can help me put it to use.

STEVE PETERSON
via the Internet

PC MAGAZINE: You're quite right. The function works properly only if all the sheets—from the first one in the book to the one where you

enter the function—are worksheets. If you let Excel put its module sheet at the top of the stack, the function fails. The simplest solution is to move the module sheet to the end of the workbook. (Right-click the Page tab, choose Move or Copy, then scroll to the bottom of the list and choose Move to End.)

As for making the recalc automatic, a simple addition will do it. Just start the function as follows:

```
Function YTD(CellRef as Double)
Application.Volatile
etc.
End Function
```

Of course, also make sure you have recalc set to auto.—Craig Stinson

DATABASES

Custom Splash Screens in Paradox For Windows



Have you ever wanted to use your own splash screen instead of the one displayed by Paradox for Windows? You can do it if you add the line

```
MYOWNSPLASHSCREEN=C:\DIRECTORY\BITMAP
->.BMP
```

to your WIN.INI file in the [PDOXWIN] section. This setting lets you choose a bitmap to display when starting Paradox.

PEKKA BLOMQUIST
Leppavesi, Finland

PC MAGAZINE: This does work, but Paradox still displays a copyright notice as well as your user and company name at start-up, even when you specify your own bitmap file. In fact, the copyright notice, user name, and company name overlay your bitmap display.

There's no "official" way to prevent this, but you can make these lines invisible by setting their foreground color equal to the background color of your bitmap. The color of the copyright notice and other lines displayed at start-up is controlled by the SplashScreenTextColor setting, which you can add to your WIN.INI file in the [PDOXWIN] section. The value you specify must be an RGB (red, green, blue) value, where each component is in the range 0 to 255. To specify solid red, for instance, you'd use a value of 255 0 0. This selects 255 for the red component and 0 for the green and blue components.

Specifying your own bitmap file in Paradox for Windows won't get rid of the copyright notice, but this trick will.

As a result, if your bitmap has a solid red background and you use 255 0 0 for the SplashScreenTextColor setting, Paradox will display solid red copyright text on top of a solid red background. You won't see anything; the text has been effectively eliminated, even though it's still being displayed. For the technique to work, however, you must design your bitmap so that the area where the copyright notice and other text appear contains no foreground material at all, just background color in the same color as the SplashScreenTextColor setting. That will require some experimenting to get right.

If you're using Paradox for Windows 95, you'll have to edit the Windows 95 Registry instead of the WIN.INI file. In that case, use RegEdit to add the MyOwnSplashScreen and SplashScreenTextColor string values to the HKEY_CURRENT_USER\Software\Borland\Paradox7.0\Configuration key. You'll find that the company and user names that Paradox displays at start-up are stored there, too.

If you want to suppress the Paradox start-up title screen altogether (as well as any bitmap you've specified via the technique shown above), simply add -q to the command line.—Sal Ricciardi

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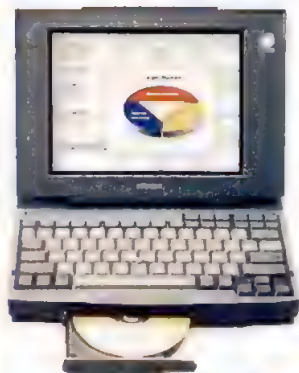
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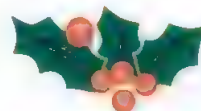
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Marquis Ethernet 28.8	404

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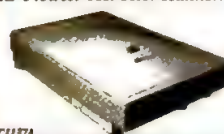
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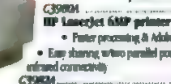
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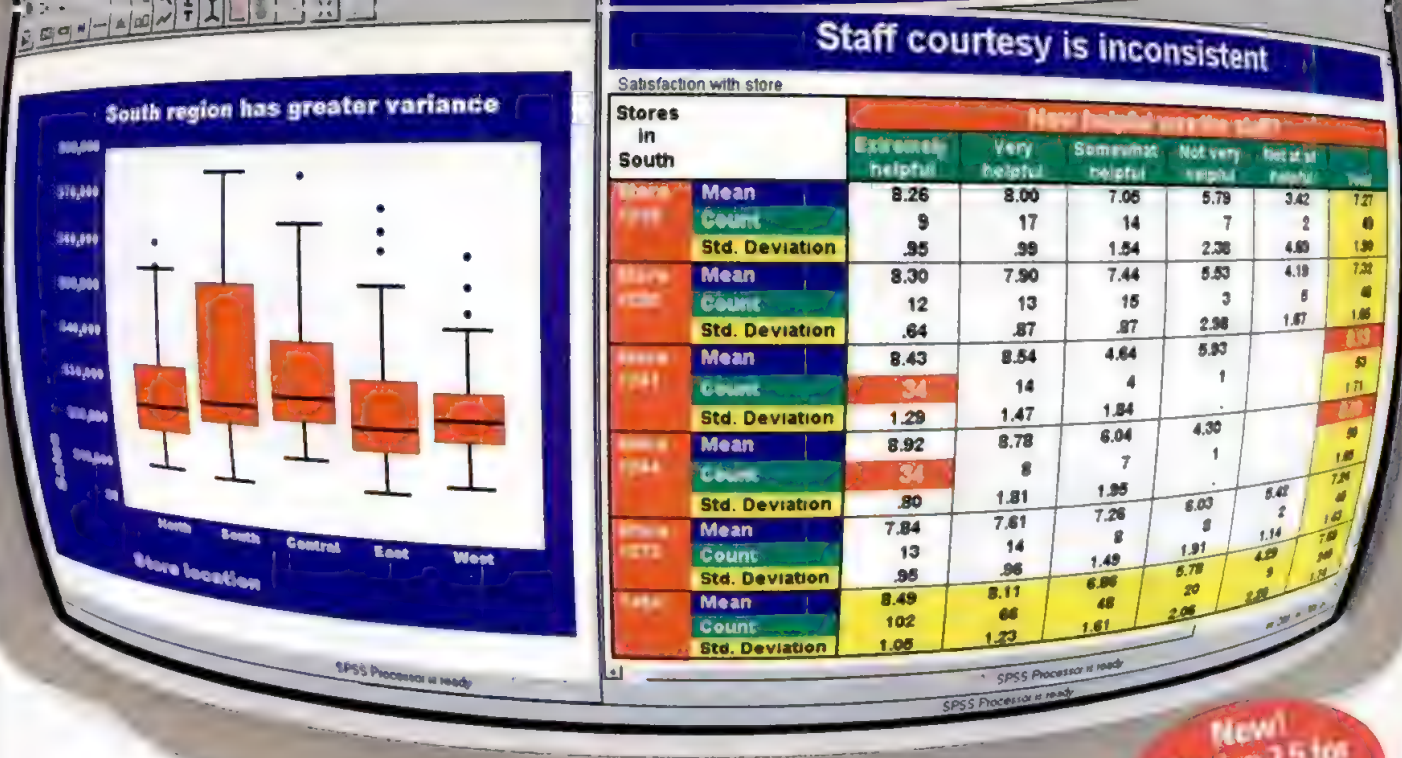
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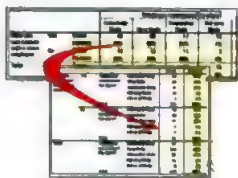


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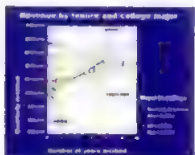
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SKU	Processor	Model	Price
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31512	IBM Aptiva P133-16/1.6	2776-C33	\$1899
31511	IBM Aptiva P150-16/2.8	2159-C55	1999
31517	IBM Aptiva P166-16/2.8G	2776-C63	2299
31615	IBM Aptiva P166-16/2.5G	2776-C67	2349
31616	IBM Aptiva P200-32/3.2G	2776-C77	2949

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32311

SKU	Model	IBM Part #	Price
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32312	IBM Aptiva P166-16/3.2	2159-S66	\$2649
32313	IBM Aptiva P200-16/2.5	2159-S74	2799

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SKU	Processor	Model	RAM/HD	Price
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30121	Pentium/133	6000	1.3GB/16MB	\$4999
30122	Pentium/100	6000	1.3GB/16MB	\$3999

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- Built-in 16-bit sound, speakers & microphone
- EDO RAM memory

150MHz Pentium!

LifeBook™ 500 Notebook



Model	Processor	Screen	RAM/HD	Price
520D	Pentium 120	11.3" Dual Scan	8/810MB	\$2299
520T	Pentium 120	11.3" Active	8/810MB	2799*
530T	Pentium 133	11.3" Active	16MB/1.3GB	3499*
555T	Pentium 150	12.1" Active	16MB/1.3GB	4399*

* Features built-in 28.8 fax/modem

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- Up to 11.3" Super VGA displays
- Built-in 16-bit SoundBlaster audio
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Milan Notebook

Model	Processor	Screen	RAM/HD	Price
Milan	Pentium 100	10.4" Dual Scan	8/810MB	\$1799*
Milan	Pentium 100	10.4" Active	8/810MB	2499*
Milan	Pentium 120	11.3" Active	8MB/1.2GB	2099
Milan	Pentium 120	11.3" Active	8MB/1.2GB	3199
Milan	Pentium 120	11.3" Active	8MB/1.2GB	3349*
Milan	Pentium 133	11.3" Active	16MB/1.2GB	3699
Milan	Pentium 133	11.3" Active	16MB/1.2GB	3849*

* Features 28.8 PCMCIA fax/modem

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- Up to 133MHz Pentium processors
- Built-in 6X CD-ROM drive
- 2MB video memory
- 16MB RAM memory on selected models



Monte Carlo Notebook

Engineered for Mobile Comfort

Model	Processor	Screen	RAM/HD	Price
Monte Carlo	Pentium 100	11.3" Active	8/810MB	\$2999
Monte Carlo	Pentium 100	11.3" Active	8/810MB	3149*
Monte Carlo	Pentium 120	11.3" Active	16MB/1GB	3699
Monte Carlo	Pentium 120	11.3" Active	16MB/1GB	3849*
Monte Carlo	Pentium 133	12.1" Active	16MB/1GB	4499
Monte Carlo	Pentium 133	12.1" Active	16MB/1GB	4649*

* Features 28.8 PCMCIA fax/modem

Models are available with Windows for Workgroups or Windows 95

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- 11.3" Dual Scan & Active Matrix displays
- Built-in SoundBlaster Pro compatible audio

Model	Processor	Screen	RAM/HD	Price
420CDS	Pentium 100	11.3" Dual Scan	8/772MB	\$2499
420CDT	Pentium 100	11.3" Active	8MB/1.2GB	3299

Satellite Pro 420



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 - 28.8 fax/modem
 - 12.1" display
- \$4599**

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ThinkPad® 365X & XD

- Built-in 6X CD-ROM drive on 365XD
- 10.4" & 11.3" SVGA displays
- 16-bit sound, speakers and microphone
- Infrared port for wireless communications

Model	Processor	Screen	RAM/HD	Price
365X	Pentium 133	11.3" Dual Scan	8MB/1GB	\$2499
365X	Pentium 120	10.4" Active	8/810MB	2499
365XD	Pentium 120	10.4" Active	8/810MB	2699
365XD	Pentium 133	11.3" Active	8MB/1.4GB	3499

Additional models available. Call for details.

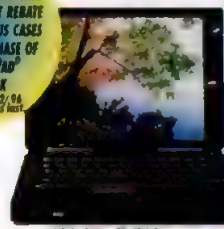
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- 16-bit SoundBlaster compatible audio
- Built-in 28.8 fax/modem on selected models
- 11.3" and 12.1" Super VGA displays

Model	Processor	Screen	RAM/HD	Price
760EL	Pentium 100	11.3" Dual Scan	8/810MB	\$3399
760ED	Pentium 133	12.1" Active	16MB/1.2GB	5399
760E	Pentium 150	12.1" Active	16MB/2.1GB	5799
760ED	Pentium 133	12.1" Active	16MB/2.1GB	6299

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ThinkPad® 760

COMPAQ



Armada

Compaq Armada

Model	Processor	Screen	RAM/HD	Price
1120	Pentium 100	10.4" Dual Scan	8/810MB	\$1879
1120T	Pentium 100	10.4" Active	8/810MB	2199
4110	Pentium 100	11.3" Dual Scan	8/810MB	2479*
4110D	Pentium 100	11.3" Dual Scan	8/810MB	2899*†
4120	Pentium 120	11.3" Dual Scan	16MB/1.1GB	2999*
4120T	Pentium 120	11.8" Active	16/810MB	3699*
4130T	Pentium 133	11.8" Active	16MB/1.1GB	4399*

* Features built-in audio

† Includes 4X CD-ROM drive

LTE 5000 Series

Model	Processor	Screen	RAM/HD	Price
5150	Pentium 100	11.3" Dual Scan	8/810MB	\$2849
5250	Pentium 120	10.4" Active	16/810MB	3599
5280	Pentium 120	11.3" Active	16MB/1.35GB	4349
5200	Pentium 120	10.4" Active	8MB/1.35GB	4720
5300	Pentium 133	12.1" Active	16MB/1.35GB	4749
5380	Pentium 133	12.1" Active	16MB/2.2GB	6299

LTE 5000 Series



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NEC



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NEC Versa 6000

Model	Processor	Screen	RAM	HD	Price
6030H	Pentium 133	12.1" Active	16MB/1.3GB		\$4999
6030X	Pentium 133	12.1" Active	16MB/1.4GB		\$3999

NEC Versa 4200

Model	Processor	Screen	RAM	HD	Price
4200	Pentium 100	10.4" Active	8/810MB		\$2999
4230	Pentium 133	10.4" Active	8MB/1.0GB		\$3899

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Hitachi E Series
Notebook



Hitachi E Series

Model	Processor	Screen	RAM	HD	Price
E100D	Pentium 100	11.3" Dual Scan	16/810MB		\$1799
E133T	Pentium 133	11.3" Active	16/810MB		\$2599

Hitachi M Series

Model	Processor	Screen	RAM	HD	Price
M100D	Pentium 100	11.3" Dual Scan	8/810MB		\$1999
M120T	Pentium 120	11.8" Active	16MB/1GB		\$3699
M133T	Pentium 133	11.8" Active	16MB/1GB		\$4399

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Extensa 600

Model	Processor	Screen	RAM	HD	Price
600CD	Pentium 120	12.1" Dual Scan	8/810MB		\$2249

TravelMate 6000

Model	Processor	Screen	RAM	HD	Price
6020	Pentium 120	11.3" Active	8MB/1.08GB		\$4099
6030	Pentium 133	12.1" Active	16MB/1.35GB		\$4799
6050	Pentium 150	12.1" Active	16MB/1.35GB		\$5299

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AST



Ascentia P

AST Ascentia A & P

Model	Processor	Screen	RAM	HD	Price
A4	Pentium 100	11.3" Dual Scan	8MB	1GB	\$2499
A4P	Pentium 120	11.3" Active	8MB	1GB	\$1799
P50	Pentium 133	12.1" Active	24MB/1.0GB		\$3979
P50	Pentium 133	12.1" Active	24MB/2.1GB		\$4349

AST Ascentia J

Model	Processor	Screen	RAM	HD	Price
J30	Pentium 100	10.4" Dual Scan	8/800MB		\$1949
J30	Pentium 100	10.4" Active	8/800MB		\$2199
J50	Pentium 133	10.4" Active Matrix	8/800MB		\$2599

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SHARP

Sharp WideNote

Model	Processor	Screen	RAM	HD	Price
W100D	Pentium 133	11.2" Wide Dual Scan	16MB/1.1GB		\$2999
W100T	Pentium 133	11.2" Wide Active	16MB/1.1GB		\$3499

3000 & 9000

Model	Processor	Screen	RAM	HD	Price
3040	Pentium 100	12.1" Dual Scan	8MB/1.1GB		\$1799
9020	Pentium 120	12.1" Dual Scan	16MB/1.1GB		\$2899†
9050	Pentium 133	11.3" Active (SHA)	16MB/1.1GB		\$3499†
9080	Pentium 133	12.1" Active (SHA)	16MB/1.3GB		\$4999†

† Includes 6X CD-ROM drive

Additional models available. Call for details.

olivetti personal computers



Olivetti Echos Series Notebook

Olivetti Echos

Model	Processor	Screen	RAM	HD	Price
Echos	Pentium 100	11.3" Dual Scan	8MB/1.3GB		\$1999
Echos	Pentium 100	10.4" Active	8MB/1.3GB		\$2599
Echos	Pentium 120	11.3" Active	8MB/1.3GB		\$2999
Echos	Pentium 133	11.8" Active	16MB/1.3GB		\$3799

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with
external
floppy
disk

Digital HiNote VP & VP 500

Model	Processor	Screen	RAM	HD	Price
HiNote VP	Pentium 120	11.3" Dual Scan	8/1.08MB		\$1899
VP 500	Pentium 120	11.3" Dual Scan	8MB/1.1GB		\$2449*
VP 500	Pentium 133	12.1" Active	8MB/1.4GB		\$3599*

* Features 6X CD-ROM drive

Digital HiNote Ultra II

Model	Processor	Screen	RAM	HD	Price
Ultra II	Pentium 133	11.3" Active	16MB/1.35GB		\$4499
Ultra II	Pentium 150	11.3" Active	16MB/1.4GB		\$4799

Additional 5500 models available. Call for details.

hp HEWLETT PACKARD



HP OmniBook
800 Notebook PC

HP OmniBook 800

Model	Processor	Screen	RAM	HD	Price
800CS	Pentium 100	10" Dual Scan	16/810MB		\$2999
800CT	Pentium 133	10.4" Active	16MB/1.4GB		\$4279

HP OmniBook 5500

Model	Processor	Screen	RAM	HD	Price
5500CTS	Pentium 120	11.3" Dual Scan	16MB/1.35GB		\$2999
5500CTS	Pentium 120	10.4" Active	16MB/1.35GB		\$3899
5500CTS	Pentium 120	12.1" Active	16MB/1.35GB		\$4149
5500CTS	Pentium 133	12.1" Active	16MB/1.35GB		\$4519
5500CTS	Pentium 133	12.1" Active	16MB/2GB		\$4859

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- Comes with over 40 software titles

Model	Processor	RAM/HD	CD	Price
23	Pentium 120	16MB/1.6GB	8X	\$1699
33	Pentium 133	16MB/1.6GB	8X	1899
65	Pentium 166	16MB/2.0GB	8X	2299
73	Pentium 200	16MB/2.5GB	8X	2649
77	Pentium 200	32MB/3.2GB	8X	2599

Monitors priced separately



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PENTIUM**



IBM Aptiva Series

IBM Aptiva S Series

- Up to 200MHz Pentium processors
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- Cordless mouse
- Integrated audio on optional monitor



IBM Aptiva S Series

Aptiva S Series

Model	Processor	RAM/HD	CD	Price
S64	Pentium 166	16MB/2.5GB	8X	\$2249
S66	Pentium 166	16MB/3.2GB	8X	2399
S74	Pentium 200	16MB/2.5GB	8X	2549
S78	Pentium 200	16MB/3.5GB	8X	2849

Aptiva S Series Monitors

Model	Size	View	Price
MM50	15"	13.7"	\$499
MM70	17"	15.7"	799



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- 33.6 data/fax/modem
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Model	Processor	RAM/HD	CD	Price
4704	Pentium 133	16MB/1.6GB	6X	\$1599
4712	Pentium 166	24MB/2.5GB	6X	1999

Presario Monitors

Model	Size	View	Price
Presario	14"	12.9"	\$399
Presario	15"	13.5"	499
Presario	17"	15.6"	749



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Model	Processor	RAM/HD	CD	Price
7130	Pentium 133	16MB/1.6GB	8X	\$1799
7160	Pentium 166	16MB/2.1GB	8X	2099
7200	Pentium 200	16MB/3.0GB	8X	2799

Infinia Monitors

Model	Size	View	Price
Infinia	15"	13.78"	\$459
Infinia	17"	16.23"	759

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- Video conferencing & tuner card on 9312 model

Model	Processor	RAM/HD	CD	Price
9304	Pentium 133	24MB/1.6GB	8X	\$1599*
9308	Pentium 166	24MB/2.5GB	8X	1999*
9310	Pentium 166	24MB/2.5GB	8X	2199*
9312	Pentium 166	24MB/2.5GB	8X	2299*
9315	Pentium 166	32MB/2.5GB	8X	2399*
9314	Pentium 200	24MB/4.0GB	8X	2499*
9316	Pentium 200	32MB/3.0GB	8X	2699*

* Features a 33.6 data/fax/voice modem

Monitors priced separately



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Ready Multimedia

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- 33.6 data/fax modem
- 256KB cache memory
- Up to 4MB standard video memory
- Tons of FREE software
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Model	Processor	RAM/HD	CD	Price
7622	Pentium 120	16MB/1.6GB	8X	\$1599
9620	Pentium 133	16MB/1.6GB	8X	1799
9624	Pentium 133	16MB/2.0GB	8X	1999
9622	Pentium 166	16MB/2.5GB	8X	2199
9628	Pentium 166	32MB/3.2GB	8X	2699
9629	Pentium 200	32MB/3.2GB	8X	2999

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- 3D accelerated graphics with MPEG support

Model	Processor	RAM/HD	CD	Price
VAIO	Pentium 166	32MB/2.1GB	8X	\$2499
VAIO	Pentium 200	32MB/2.5GB	8X	2899

VAIO Monitors

Model	Size	View	Price
VAIO	15"	13.9"	\$579



Sony VAIO Multimedia



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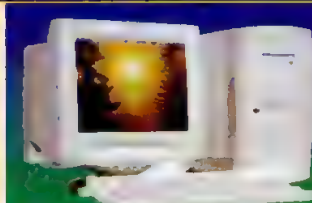
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Pentium 120, 16MB, 1.6GB, Pavilion 7035	7035	\$999
Pentium 133, 16MB, Pavilion 7110	7110	\$1,199

(Monitors priced separately)



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PRODUCT	PART #	PRICE
Pentium 75, 8MB, 772MB	405CS	\$1459
Pentium 90, 8MB, 772MB	415CS	1859

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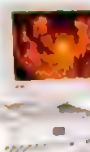
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BJC-210

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BJC-210

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Q30-1750 USI FR
BJC-4100



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Monitors priced separately

PRODUCT	PART #	PRICE
Pentium 133, 16MB, 845MB	FR-928AA-BR	\$999

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Basic	PCS10A-00R2	\$189.00
Multimedia	PCS10A-01R6	249.00

HIVAL 8X SPEED CD-ROM



Basic	PCS8A-00R2	\$119.00
Multimedia	PCS8A-01R6	189.00

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2X32, 72pin non-parity
\$7900
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Generic 16MB Memory Upgrade
4x32, 72pin parity
\$14900
#322-0002

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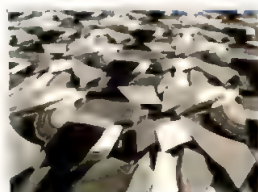
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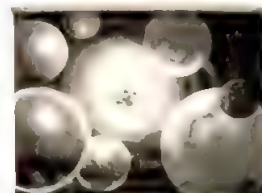
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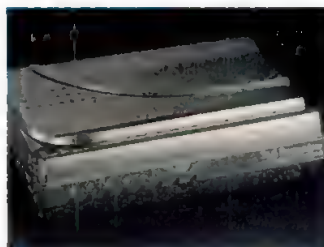
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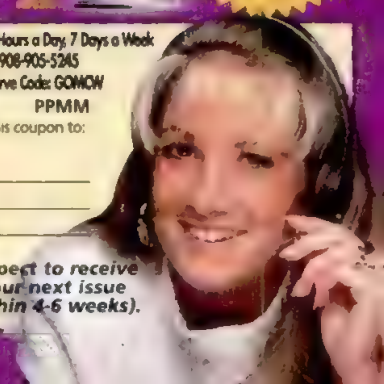
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1280MB	Caviar	10ms	128	5,200	16.6MB/sec	3.5" 1"H	Enhanced IDE	3 Year	WD21200AB	199.99
1620MB	Caviar	10ms	128	5,200	16.6MB/sec	3.5" 1"H	Enhanced IDE	3 Year	WD21600AB	215.99
2113MB	Caviar	12ms	128	5,200	16.6MB/sec	3.5" 1"H	Enhanced IDE	3 Year	WD22100AB	269.99
2559MB	Caviar	12ms	128	5,200	16.6MB/sec	3.5" 1"H	Enhanced IDE	3 Year	WD32500AB	299.99
3166MB	Caviar	12ms	128	5,200	16.6MB/sec	3.5" 1"H	Enhanced IDE	3 Year	WD33100AB	379.99
Mobile Products										
810MB	Marathon	16ms	120	4,500	16.6MB/sec	2.5" 19.15mm	Fast ATA-2	3 Year	ST9816AG	\$349.99
1650MB	Marathon si	14ms	120	4,500	16.6MB/sec	2.5" 12.7mm	Fast ATA-2	3 Year	ST1350AG	429.99
Desktop PC Products										
1082MB	ST31081A	14ms	64	3,600	16.6MB/sec	3.5" 1"H	Fast-ATA-2	3 Year	ST31081AB	\$169.99
1275MB	ST31276A	12.5ms	64	4,500	16.6MB/sec	3.5" 1"H	Fast-ATA-2	3 Year	ST31276AB	189.99
1700MB	Medalist 1720	12ms	128	4,500	16.6MB/sec	3.5" 1.02"H	Fast-ATA-2	3 Year	ST31720AB	219.99
2113MB	Medalist 2140	10ms	128	5,400	16.6MB/sec	3.5" 1.02"H	Fast-ATA-2	3 Year	ST32140AB	249.99
2560MB	Medalist Pro	11ms	128	5,400	16.6MB/sec	3.5" 1.02"H	Fast-ATA-2	3 Year	ST32520AB	315.99
2.5" Hard Drives										
810MB	Slimline	13ms	128	4,200	13.3MB/sec	2.5" 12.7MM	Fast-ATA	1 Year	MK1926FCV	\$299.99
130MB	Slimline	13ms	128	4,200	13.3MB/sec	2.5" 12.7MM	Fast-ATA	1 Year	MK1301MAV	449.99
130MB	Notebook	13ms	128	4,200	13.3MB/sec	2.5" 19MM	Fast-ATA	1 Year	MK2720FC	459.99
2100MB	Notebook	13ms	128	4,200	13.3MB/sec	2.5" 19MM	Fast-ATA	1 Year	MK2101MAN	599.99
1090MB	Winchester	12ms	64	4,500	16.6MB/sec	3.5" 1"H	Fast-ATA-2	3 Year	FJ1614AB	\$175.99
1280MB	Winchester	12ms	64	4,500	16.6MB/sec	3.5" 1"H	Fast-ATA-2	3 Year	FJ1636AB	199.99
1700MB	Winchester	12ms	64	4,500	16.6MB/sec	3.5" 1"H	Fast-ATA-2	3 Year	FJ1623AB	229.99
2100MB	Winchester	12ms	64	4,500	16.6MB/sec	3.5" 1"H	Fast-ATA-2	3 Year	FJ1624AB	279.99
2560MB	Winchester	12ms	64	4,500	16.6MB/sec	3.5" 1"H	Fast-ATA-2	3 Year	FJ1638AB	299.99
1708MB	Sirocco	11ms	128	4,500	16.6MB/sec	3.5" 1"H	Fast-ATA-2	3 Year	QUSR1708AB	\$225.99
2168MB	Fireball™	10.5ms	128	4,500	16.6MB/sec	3.5" 1"H	Fast-ATA-2	3 Year	QUTM2110AB	279.99
2550MB	Sirocco	11ms	128	4,500	16.6MB/sec	3.5" 1"H	Fast-ATA-2	3 Year	QUSR2550AB	319.99
3254MB	Fireball™	10.5ms	128	4,500	16.6MB/sec	3.5" 1"H	Fast-ATA-2	3 Year	QUTM3200AB	359.99
1336MB	Durango	11ms	64	4,500	16.6MB/sec	3.5" 1"H	Enhanced IDE	3 Year	MX71336AB	\$209.99
1670MB	Durango	12ms	256	4,500	16.6MB/sec	3.5" 1"H	Enhanced IDE	3 Year	MX71626AB	235.99
2004MB	Durango	11ms	128	4,500	16.6MB/sec	3.5" 1"H	Enhanced IDE	3 Year	MX72004AB	285.99
1700MB	Deskstar	12ms	128	4,500	16.6MB/sec	3.5" 1"H	Fast-ATA-2	3 Year	IB06H8724B	\$299.99

*Capacities based on manufacturer's quoted capacity where 1MB=1,048,576 bytes. **Expert's Choice Drives

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Capacity*	Model	Access	Cache	RPM	Max. Trans. Rate	Form/Hgt.	Interface	Mfr.'s Wrrty.	Product Code	Price
50 Pin Standard and 68 Pin Wide Value Drives										
1080MB	Medalist	12.5ms	128	5,400	10MB/sec	3.5" HH	Fast SCSI-2 A/V	3 Year	ST51080NB	\$249.99
1050MB	Hawk 2XL	9ms	512	5,411	20MB/sec	3.5" 1"H	Ultra SCSI	3 Year	ST31055NB	349.99
1050MB	Hawk 2XL	9ms	512	5,411	40MB/sec	3.5" 1"H	Ultra Wide SCSI	3 Year	ST31055WB	389.99
2149MB	Hawk 2XL	9ms	512	5,400	20MB/sec	3.5" 1"H	Ultra SCSI	5 Year	ST32155NB	479.99
2149MB	Hawk 2XL	9ms	512	5,400	40MB/sec	3.5" 1"H	Ultra Wide SCSI	5 Year	ST32155WB	515.99
4294MB	Hawk 4	9ms	512	5,411	10MB/sec	3.5" HH	Fast SCSI-2 A/V	5 Year	ST15230NB	949.99
4294MB	Hawk 4	9ms	512	5,411	20MB/sec	3.5" HH	Fast Wide SCSI-2 A/V	5 Year	ST15230WB	989.99
50 Pin Standard and 68 Pin Wide Performance Drives										
2147MB	Barracuda 2LP	8ms	512	7,200	10MB/sec	3.5" 1"H	Fast SCSI-2 A/V	5 Year	ST32550NB	\$749.99
2147MB	Barracuda 2LP	8ms	512	7,200	20MB/sec	3.5" 1"H	Fast Wide SCSI-2 A/V	5 Year	ST32550WB	799.99
2150MB	Barracuda 4LP	8ms	512	7,200	20MB/sec	3.5" 1"H	Ultra SCSI	5 Year	ST32171NB	749.99
2150MB	Barracuda 4LP	8ms	512	7,200	40MB/sec	3.5" 1"H	Ultra Wide SCSI	5 Year	ST32171WB	799.99
4294MB	Barracuda 4	8ms	1,024	7,200	10MB/sec	3.5" HH	Fast SCSI-2 A/V	5 Year	ST15150NB	1,049.99
4294MB	Barracuda 4	8ms	1,024	7,200	20MB/sec	3.5" HH	Fast Wide SCSI-2 A/V	5 Year	ST15150WB	1,099.99
4350MB	Barracuda 4LP	8ms	512	7,200	20MB/sec	3.5" 1"H	Ultra SCSI	5 Year	ST34371NB	1,149.99
4350MB	Barracuda 4LP	8ms	512	7,200	40MB/sec	3.5" 1"H	Ultra Wide SCSI	5 Year	ST34371WB	1,199.99
9090MB	Elite 9	11ms	1,024	5,400	10MB/sec	5.25" FH	Fast SCSI-2 A/V	5 Year	ST410800NB	1,999.99
9090MB	Elite 9	11ms	1,024	5,400	20MB/sec	5.25" FH	Fast Wide SCSI-2 A/V	5 Year	ST410800WB	2,049.99
9100MB	Barracuda 9	8ms	512	7,200	20MB/sec	3.5" HH	Ultra SCSI	5 Year	ST19171NB	2,099.99
9100MB	Barracuda 9	8ms	512	7,200	40MB/sec	3.5" HH	Ultra Wide SCSI	5 Year	ST19171WB	2,149.99
2170MB	Enterprise	8ms	512	7,200	20MB/sec	3.5" 1"H	Ultra SCSI	5 Year	WD2170SB	\$759.99
2170MB	Enterprise	8ms	512	7,200	40MB/sec	3.5" 1"H	Ultra Wide SCSI	5 Year	WD2170WB	799.99
4360MB	Enterprise	8ms	512	7,200	20MB/sec	3.5" 1"H	Ultra SCSI	5 Year	WD4360SB	1,129.99
4360MB	Enterprise	8ms	512	7,200	40MB/sec	3.5" 1"H	Ultra Wide SCSI	5 Year	WD4360WB	1,179.99
4360MB	Enterprise	8ms	512	7,200	40MB/sec	3.5" 1"H	Ultra Wide SCSI-3SCA	5 Year	WD4360WC	1,199.99
2100MB	Aries	8.5ms	512	5,400	10MB/sec	3.5" 1"H	Fast SCSI-2	5 Year	MC4421SB	\$429.99
2100MB	Tjurus	8.9ms	512	7,200	10MB/sec	3.5" 1"H	Fast SCSI-2	5 Year	MC4221SB	549.99
4300MB	Capricorn	8.5ms	512	7,200	10MB/sec	3.5" HH	Fast SCSI-2	5 Year	MC3243SB	859.99
9100MB	Scorpio	12ms	512	5,400	10MB/sec	5.25" FH	Fast SCSI-2	5 Year	MC1991B	1,649.99
68 Pin Wide SCSI Drives										
2100MB	Taurus	8.5ms	512	7,200	20MB/sec	3.5" 1"H	Fast Wide SCSI-2 A/V	5 Year	MC4221AVWB	\$739.99
4300MB	Capricorn	8.5ms	512	7,200	20MB/sec	3.5" HH	Fast Wide SCSI-2 A/V	5 Year	MC3243AVWB	1,029.99
9100MB	Scorpio	12ms	512	5,400	20MB/sec	3.5" FH	Fast Wide SCSI-2 A/V	5 Year	MC1991AVWB	1,899.99
9100MB	Tomahawk	8ms	512	7,200	20MB/sec	3.5" HH	Ultra SCSI	5 Year	MC3391NSB	1,999.99
9100MB	Tomahawk	8ms	512	7,200	40MB/sec	3.5" HH	Ultra Wide SCSI	5 Year	MC3391WSB	2,039.99
1280MB	Tempest	10.5ms	128	4,500	20MB/sec	3.5" 1"H	Ultra SCSI	3 Year	QUTM1280SB	\$319.99
2100MB	Tempest	10.5ms	128	4,500	20MB/sec	3.5" 1"H	Ultra SCSI	3 Year	QUTM2100SB	399.99
3200MB	Tempest	10.5ms	128	4,500	20MB/sec	3.5" 1"H	Ultra SCSI	3 Year	QUTM3200SB	499.99
2150MB	Atlas	8ms	1,024	7,200	20MB/sec	3.5" 1"H	Fast Wide SCSI-2	5 Year	QUXP3125WB	679.99
4300MB	Atlas	8ms	1,024	7,200	20MB/sec	3.5" 1"H	Fast Wide SCSI-2	5 Year	QUXP3430WB	949.99

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AST Ascentia J30 P100 10.4" DSTN 840MB RAM	810MB HDD "Track Stick" 501780-401	1,799.99
AST Ascentia J30 P100 10.4" DSTN 840MB RAM	800MB-R HDD "Track Stick" 501945-401	1,815.99
AST Ascentia J30 P100 10.4" TFT 840MB RAM	800MB-R HDD "Track Stick" 501945-401	2,199.99
AST Ascentia J50 P133 10.4" TFT 840MB RAM	800MB-R HDD "Track Stick" 501947-401	2,669.99
AST Ascentia J50 P100 11.3" DSTN 840MB RAM	800MB-R HDD 4X CD Touch Pad 501985-301	2,619.99
AST Ascentia J50 P100 11.3" TFT 16MB RAM	1GB-R HDD Touch Pad 503039-301	CALL
AST Ascentia J50 P100 11.3" TFT 24MB RAM	2.1GB-R HDD Touch Pad 503039-401	CALL
AST Ascentia P50 P133 11.3" TFT 840MB RAM	800MB-R HDD 4X CD Touch Pad 501987-301	3,565.99
AST Ascentia P50 P100 11.3" TFT 840MB RAM	1.2GB-R HDD 4X CD Touch Pad 501987-401	3,755.99
AST Ascentia P50 P133 12.1" TFT 24MB RAM	1GB-R HDD Touch Pad 503041-301	3,989.99
AST Ascentia P50 P133 12.1" TFT 24MB RAM	2.1GB-R HDD Touch Pad 503041-401	4,359.99
IBM ThinkPad 365ED 5186 10.4" DSTN 840MB RAM	540MB HDD 4X CD TrackPoint III 802525003	2,299.99
IBM ThinkPad 365XD P100 10.4" DSTN 840MB RAM	540MB HDD 4X CD TrackPoint III 802525003	2,299.99
IBM ThinkPad 365XD P100 10.4" DSTN 840MB RAM	1.0GB HDD 4X CD TrackPoint III 802525007	2,949.99
IBM ThinkPad 365X P120 10.4" TFT 840MB RAM	810MB HDD Opt. CD TrackPoint III 802525009	2,499.99
IBM ThinkPad 365X P120 10.4" TFT 840MB RAM	810MB HDD 4X CD TrackPoint III 802525010	2,699.99
IBM ThinkPad 365X P133 11.3" DSTN 840MB RAM	1.0GB HDD Opt. CD TrackPoint III 802525011	2,499.99
IBM ThinkPad 365XD P133 11.3" TFT 840MB RAM	1.35GB HDD 6X CD TrackPoint III 802525109	3,499.99
IBM ThinkPad 760EL P100 11.3" DSTN 872MB RAM	810MB HDD TrackPoint III 802547000	3,199.99
IBM ThinkPad 760ELD P100 12.1" TFT 872MB RAM	810MB-R HDD TrackPoint III 802547001	4,499.99
IBM ThinkPad 760EL P120 11.3" DSTN 872MB RAM	810MB HDD TrackPoint III 802547002	3,399.99
IBM ThinkPad 760E P120 12.1" TFT 872MB RAM	1.2GB-R HDD TrackPoint III 802548000	4,549.99
IBM ThinkPad 760E P133 12.1" TFT 1680MB RAM	1.0GB-R HDD TrackPoint III 802548001	5,999.99
IBM ThinkPad 760ED P133 12.1" TFT 1680MB RAM	1.2GB-R HDD 4X CD TrackPoint III 802548002	6,999.99
IBM ThinkPad 560 P100 11.3" DSTN 840MB RAM	810MB HDD TrackPoint III 802549000	2,699.99
IBM ThinkPad 560 P120 12.1" TFT 840MB RAM	810MB HDD TrackPoint III 802549001	3,749.99
IBM ThinkPad 560 P133 12.1" TFT 840MB RAM	1.0GB HDD TrackPoint III 802549002	4,199.99
Compaq Armada 1120 P100 10.4" DSTN 824MB RAM	810MB HDD Optional Trackball 205500-000	1,899.99
Compaq Armada 1120T P100 10.4" TFT 824MB RAM	810MB HDD Optional Trackball 205500-000	2,249.99
Compaq Armada 4110 P100 11.3" DSTN 840MB RAM	810MB HDD Optional CD Touch Pad 217050-001	2,499.99
Compaq Armada 4110D P100 11.3" DSTN 840MB RAM	810MB HDD Optional CD Touch Pad 217050-001	2,899.99
Compaq Armada 4120 P100 11.3" DSTN 1648MB RAM	1.0GB HDD Optional CD Touch Pad 217050-002	3,095.99
Compaq Armada 4120T P120 11.8" TFT 1648MB RAM	810MB HDD Optional CD Touch Pad 217050-002	3,775.99
Compaq Armada 4130T P133 11.8" TFT 1648MB RAM	1.0GB HDD Optional CD Touch Pad 228500-007	4,449.99

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Toshiba Satellite 110CS P100 11.3" DSTN 840MB RAM	810MB HDD Accupoint TA110CS	\$1,979.99
Toshiba Satellite 110CT P100 11.3" TFT 840MB RAM	810MB HDD Accupoint TA110CT	2,449.99
Toshiba Satellite Pro 420CDS P100 11.3" DSTN 840MB RAM	810MB HDD 6X CD Accupoint TA20CDS	2,449.99
Toshiba Satellite Pro 420CDT P100 11.3" TFT 840MB RAM	1.2GB HDD Accupoint TA20CDT	2,211.99
Toshiba Tecra 650CT P133 11.3" TFT 1680MB RAM	1.2GB HDD 28.8 Accupoint TA650CT	4,399.99
Toshiba Tecra 500CS P120 12.1" DSTN 1614MB RAM	1.2GB HDD 6X CD 28.8 Accupoint TA500CS	3,599.99
Toshiba Tecra 500CS P120 12.1" TFT 1614MB RAM	1.2GB HDD 6X CD 28.8 Accupoint TA500CT	4,599.99
Toshiba Tecra 730CDT P150 12.1" TFT 1614MB RAM	2.0GB HDD 6X CD 28.8 TA730CT	5,999.99
Ti Extensa 510 P100 11.3" DSTN 840MB RAM	810MB-R HDD Touch Pad Text810	1,769.99
Ti Extensa 600CD P120 12.1" DSTN 840MB RAM	810MB-R HDD 6X CD Touch Pad Text600CD	2,259.99
Ti Extensa 570CDT P100 10.4" TFT 840MB RAM	1.2GB-R HDD 6X CD Touch Pad Text570CT	2,889.99
Ti Extensa 570CDTSE P100 10.4" SVGA 872MB RAM	2.0GB-R HDD Text570CTSE	3,435.99
Ti Extensa 650CD P133 12.1" DSTN 16MB RAM	1.2GB-R HDD 8X CD Touch Pad Text650CD	3,235.99
Ti Extensa 650CDT P133 11.3" TFT 16MB RAM	2.1GB-R HDD 8X CD Touch Pad Text650CDT	3,729.99
Ti TravelMate 6020 P120 11.3" SVGA 872MB RAM	1.0GB-R HDD "The Point" Text6020	3,999.99
Ti TravelMate 6030 P133 12.1" SVGA 1672MB RAM	1.0GB-R HDD "The Point" Text6030	4,799.99
Ti TravelMate 6050 P150 12.1" SVGA 1672MB RAM	1.35GB-R HDD "The Point" Text6050	5,399.99

PC Cards

USR Sportster 28.8/14.4 V.34 MBUSP2P2P	\$199.99
Megahertz 28.8/33.6/14.4 V.34 MBX128B	209.99
Megahertz 28.8/33.6/14.4 V.34 Cellular MBX200B	219.99
Megahertz 28.8/33.6/14.4 V.34 Cellular MBX200B	229.99
Megahertz 28.8/33.6/14.4 Ether Combo TP	289.99
Megahertz 28.8/33.6/14.4 Ether Combo BNC TP	319.99
New Media 28.8/28.8 Faxmodem MAC010B	159.99
New Media 28.8/14.4 Faxmodem MAC0051P	179.99
New Media 28.8/14.4 Faxmodem MAC0004R	199.99
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New Media Waveammer Sound Card MMAC0010B	219.99
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HP Deskjet 300 Portable 3ppm	
600dpi 48K HPD300	249.99
HP LaserJet SL-45 4ppm 600dpi 1MB HP45L	429.99
Lexmark Optra E Laser 6ppm 600dpi 1MB	
LEX40200A	549.99
Lexmark Color Jetprinter 1020 3ppm	
600dpi 29K LEX1020	149.99
Lexmark WinWriter 150C 3ppm	
600dpi 29K LEX407000A	279.99
Canon BJ-30 Portable 3.5ppm	
720x360dpi 35K CMH30	269.99
Canon BJC-70 Color Portable 3.8ppm	
720x360dpi 35K CMH70	299.99
Canon LBP-465 Laser 4ppm	
600dpi 128K CMH465	379.99
Epson Stylus Color 500 Ink Jet 4ppm	
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Okidata 4w LED 4ppm 600dpi 128K OK4w	299.99
Okidata OL600C LED 6ppm	
600dpi 1MB OK600C	399.99

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Magnavox 15" 2015 1024x768 CMA2015	289.99
Magnavox 17" Magnascan 1280x1024 CMA1280	589.99
Magnavox 20" Magnascan 1280x1024 CMA20CMA	899.99
Mag 15" DX1595 1280x1024 CMX1595	354.99
Mag 15" DX15T 1280x1024 CMX15T	384.99
Mag 17" DX1795 1280x1024 CMX1795	599.99
Mag 17" DX700T 1280x1024 CMX700T	704.99
Mag 17" MXP17F 1600x1200 CMX17F	724.99
Mag 21" MX21F 1600x1200 CMX21F	1,499.99
Princeton 14" EQ40 1024x768 CMPEQ40	244.99
Princeton 15" EO50 1280x1024 CMPEO50	309.99
Princeton 17" EO17 1280x1024 CMPEO17	614.99
Princeton 17" Ultra 17+ 1600x1280 CMPU17+	609.99
CTX 14" 1451C 1024x768 CMCT1451C	239.99
CTX 17" VL700 1280x1024 CMCTVL700	589.99
CTX 17" 1785GME 1600x1280 CMCT1785GME	659.99
CTX 20" 2085 1600x1200 CMCT2085	1,099.99

Video Cards

ATI Graphics Xpression PCI 2MB VCAT020P	\$139.99
ATI Graphics Xpression ISA 2MB VCAT020A	89.99
ATI Graphics Xpression PCI 1MB VCAT010P	79.99
ATI Graphics Xpression PCI 2MB VCAT020P	89.99
ATI Graphics Pro Turbo PCI 2MB VCAT070P	212.99
ATI Graphics Pro Turbo PCI 4MB VCAT070P	299.99
Truevision Bravado 1000 w/Adobe	
Premiere 4.2 Bundle MMV1000	819.99
Number Nine 9FX 331 PCI 1MB VCN931P1	94.99
Number Nine 9FX 331 PCI 1MB VCN931P2	121.99
Number Nine 64-bit Reality 2MB VCN9P332	184.99
Hercules Dynamite 128 PCI 2MB VCHDY128	146.99
Hercules Terminator 64 3D PCI 2MB VCHET643D	184.99

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APC Back-UPS Pro 420 PnP UPAPC420P	239.99
APC Back-UPS Pro 650 PnP UPAPC650P	299.99
APC Smart-UPS 420 V/S UPAPCS420	249.99
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Computer Systems.....	309	332
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Mass Storage Devices.....	311	
Multi-Media.....		
Music/Midi.....	314	
Networking.....	314	
Peripherals.....	315	
Power Supplies.....		
Security.....		
Video.....		

SOFTWARE

	PREMIER	CLASSIFIED
Barcode.....	334	
Business Applications.....	316	334
—Single-Solution.....	317	337
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Cellular Phones.....		
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Security.....	325.....338
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Windows.....	
Adult.....	342
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Computer Insurance.....	
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Desktop Publishing.....	
On-Line.....	320,321,326...340
Scanning Services.....	
Software Duplication.....	340
Training/Tutorial.....	326
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Business Opportunities.....	
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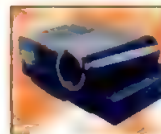
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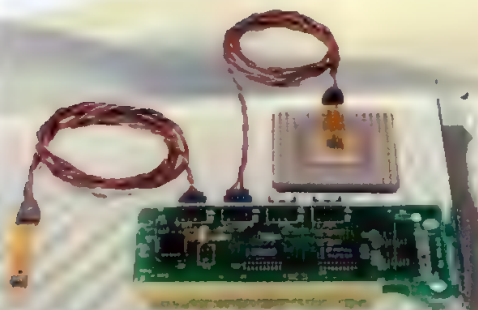


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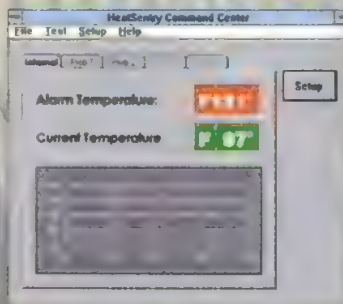
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AUTODESK ALTOCAD LT 2 WIN 5.11 CD	189 <td>LOTUS SMARTSUITE 4.0 WIN 3.11 DSK</td> <td>289<td>MS OFFICE PRO 7.0 WIN 95 DSK</td><td>389<td>SYMANTEC ACT 2 WIN 5.11 DSK</td><td>179</td><td></td><td></td></td></td>	LOTUS SMARTSUITE 4.0 WIN 3.11 DSK	289 <td>MS OFFICE PRO 7.0 WIN 95 DSK</td> <td>389<td>SYMANTEC ACT 2 WIN 5.11 DSK</td><td>179</td><td></td><td></td></td>	MS OFFICE PRO 7.0 WIN 95 DSK	389 <td>SYMANTEC ACT 2 WIN 5.11 DSK</td> <td>179</td> <td></td> <td></td>	SYMANTEC ACT 2 WIN 5.11 DSK	179		
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		MS ACCESS 2.0 WIN 5.11 DSK	235 <td>MS OFFICE ST 7 WIN 95 CD</td> <td>289<td>NORTON DESKTOP 4 WIN 5.11 DSK</td><td>129</td><td></td><td></td></td>	MS OFFICE ST 7 WIN 95 CD	289 <td>NORTON DESKTOP 4 WIN 5.11 DSK</td> <td>129</td> <td></td> <td></td>	NORTON DESKTOP 4 WIN 5.11 DSK	129		

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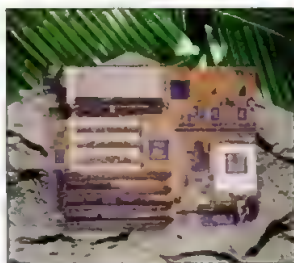
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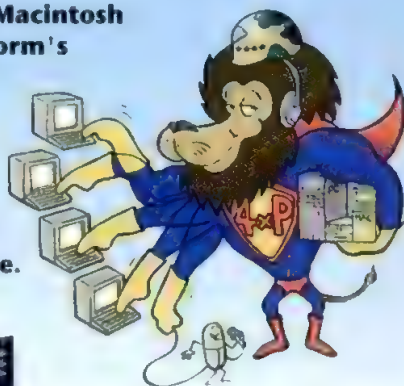
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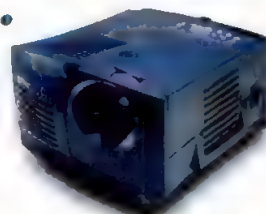
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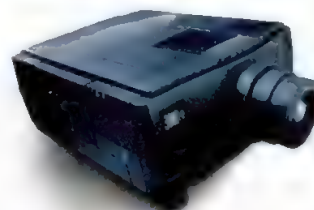
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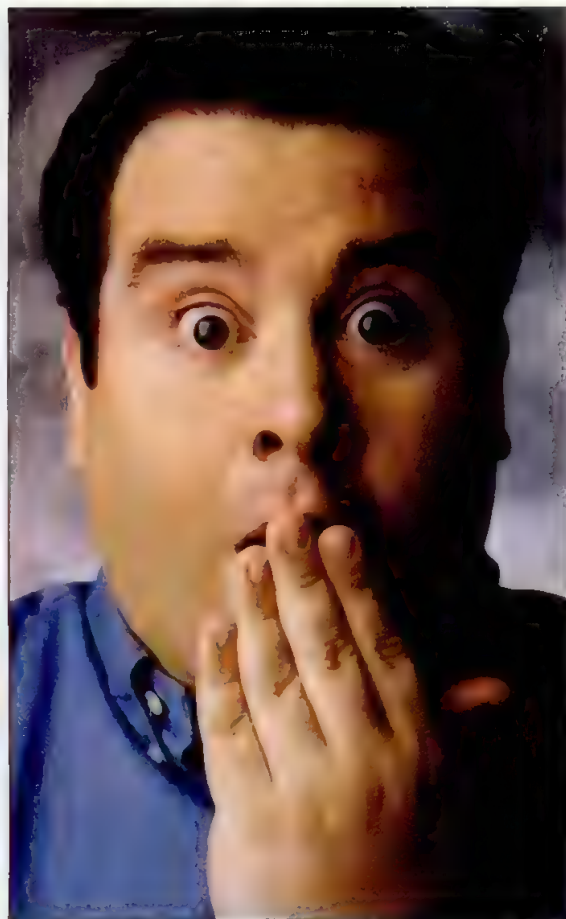
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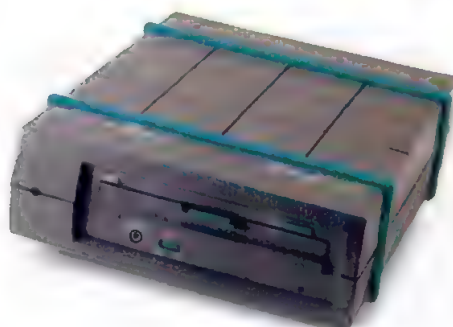
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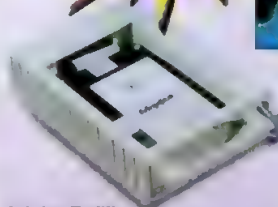


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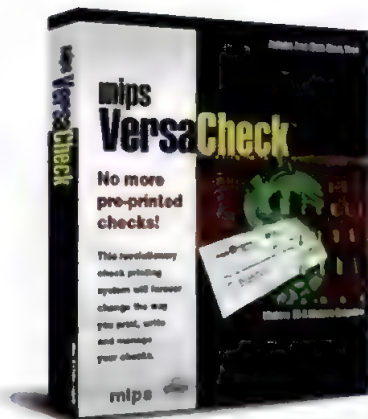
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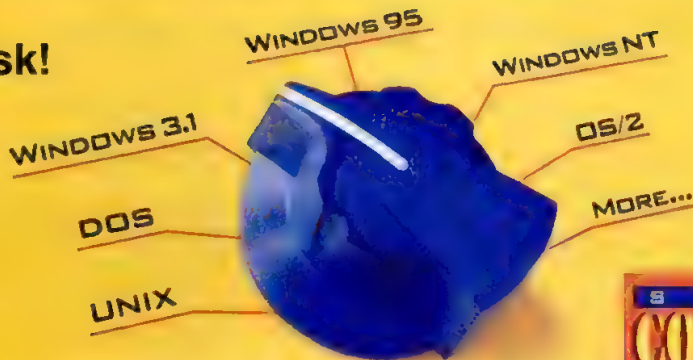
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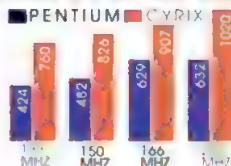
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Virus Bulletin

July 1996

POLYMORPHIC VIRUSES

Dr Solomon's
90.7%**McAfee**
65.2%**Norton AntiVirus**
59.7%**Infosecurity News**

March/April 1996

OVERALL DETECTION RATE

Dr Solomon's
96.5%**McAfee**
91.4%**Norton AntiVirus**
87.2%**Virus Research Unit**

University of Tampere

Summer 1996

ANTIVIRUS SCANNER ANALYSIS

Dr Solomon's
97.0%**Norton AntiVirus**
88.0%**McAfee**
84.6%

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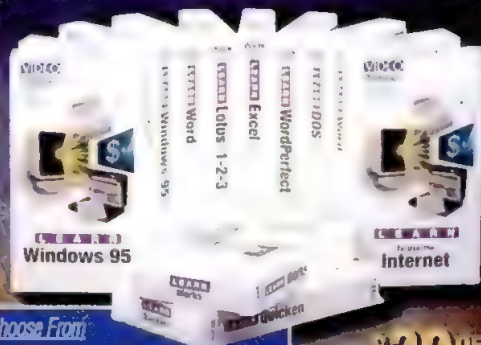
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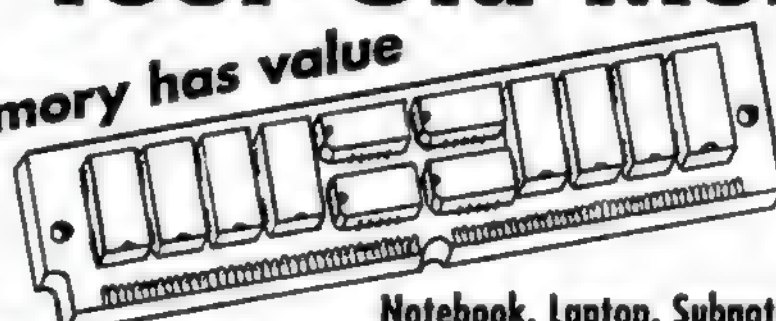
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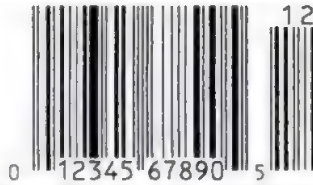


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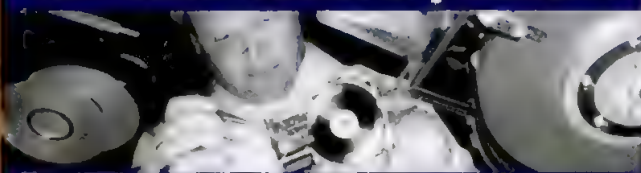
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At Home

A SPECIAL REPORT ON PRODUCTS FOR THE PERSONAL SIDE OF COMPUTING



Holiday Gift Ideas

By Michael E. Ryan

THE HOLIDAY SEASON IS UPON US, WHICH means that it must be time for *PC Magazine's* third annual holiday gift guide. This year, instead of giving you a rundown of the best products of the past year, we've peered into our crystal ball to bring you previews of 96 upcoming software releases. In addition, we give you brief looks at 5 nifty gadgets—for a total of 101 products, all of which should

be on the shelves in time for the holidays. While there is a chance that some of the software titles included in this story won't ship on time, we're confident that the vast majority will.

So whether you're interested in games, productivity titles, or other products for the leisure side of personal computing, we've got plenty of gift ideas to help you wrap up your shopping for the PC users on your list.

Games and Entertainment ...	350
Gadgets and Gizmos	365
Children's Software	367
Productivity and Fun	372
Reference Software	377

Games and Entertainment

ACTION

Amok (\$50; GT Interactive, 800-610-4847, www.gtinteractive.com). Robot games are all the rage this holiday season, and Amok is one of the cooler ones. You play a mercenary whose job it is to start wars both on land and under the waves in your Slambird (where they get these names, we simply don't know). The graphics are impressive, and the action is fun.

DeathDrome (\$55; Viacom New Media, 800-469-2539, www.viacomnewmedia.com). In this first-person game, you play a prisoner who must fight for your freedom as entertainment for the masses (the "no cruel and unusual punishment" idea having gone by the boards). You pick a scooterlike vehicle and zoom around futuristic arenas, knocking off your fellow inmates before your time runs out.

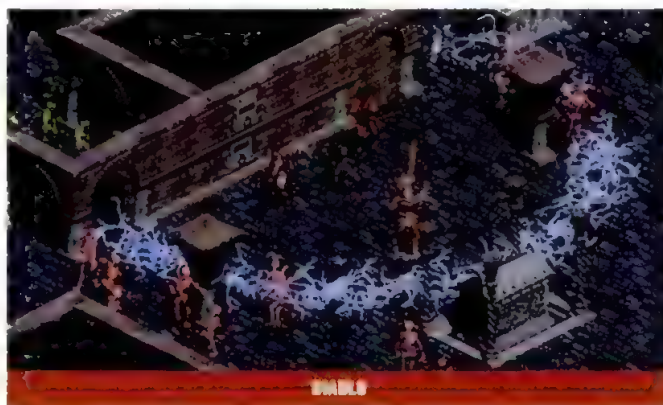
Diablo (\$50; Blizzard Entertainment, 800-953-7669, www.blizzard.com). This fantasy role-playing action game could very well be one of the hottest releases of the season. With spectacular graphics and special effects, fast-paced dungeon-crawling action, random level generation, and free Internet-based multiplayer support, Diablo has all the makings of a classic. Make it a point to get a look at this one.

G-Nome (\$50; 7th Level, 800-884-8863, www.7thlevel.com). Human pilots in huge robots lumbering across the battlefield. Sound familiar? Unlike other mech games, this one lets you eject out of your mech and run around the battlefield on foot. You can even commandeer other mechs. Also, G-Nome's graph-

ics are very nice, easily equal to the state of the art.

Hunter Hunted (\$55; Sierra On-Line, 800-757-7707, www.sierra.com). Hunter Hunted is similar to levels-and-ladders games like Donkey Kong, except that *this* gorilla packs a gun. This gritty, fast-paced thriller keeps you on your toes as you run around the game's 2-D levels, picking up weapons and shooting the bad guys. Hunter Hunted also offers good multiplayer support, including a split-screen option.

HyperBlade (\$50; Activision, 800-477-3650, www.activision.com). HyperBlade is like a futuristic, ultraviolent cross between hockey and jai alai. The object is to bring your ball down the 3-D arena and fire it into the goal before you get bowled over by your opponents. The playing surface



is littered with dangerous, potentially lethal obstacles, and the opposing team is always out for your head. HyperBlade has nice high-resolution graphics and lots of fast action.

Interstate 76 (\$50; Activision, 800-477-3650, www.activision.com). Imagine a world where the gas crisis never ended and America's roads are about as safe as those in the movie *Mad Max*. Interstate 76 is like MechWarrior 2 with muscle cars, and it grooves to the funkier



soundtrack we've ever heard in a PC game. You play Groove Champion, out to avenge the death of your car vigilante sister. Your hip comrade (who sounds like Samuel L. Jackson's character in *Pulp Fiction*) will help out as you go on and off the

Outlaws (\$55; LucasArts Entertainment, 800-985-8227, www.lucasarts.com). You play a drifter out for revenge in this intriguing, spaghetti Western-style game from LucasArts. Part first-person action game, part adventure game, and part multiplayer shoot-'em-up, Outlaws has something for just about any gaming fan.

Robotron X (\$45; GT Interactive, 800-610-4847, www.gtinteractive.com). Based on the classic, frenetic coin-operated game Robotron 2084, this title is an exercise in controlled mayhem. In it, you become a running, spinning one-man killing machine, blowing up robots and trying to save your dazed family members. Sure, it's a rather simple concept, but it's fun.

Rocket Jockey (\$50; SegaSoft, 800-734-2763, www.segasoft.com). In this simple but very addictive game, you ride a rocket-powered craft around a rodeo-like arena, avoiding or attacking your fellow rocket jockeys. Watch out, though, because you may get knocked off your rocket and have to wander around the arena on foot.

Scorched Planet (\$40; Virgin Interactive Entertainment, 800-874-4607, www.vie.com). Remember the arcade game Defender, in which you flew along shooting mutants and saving humans? Scorched Planet brings

Our Contributors: MARY E. BEHR and MICHELLE SCHOENUNG are staff editors of *PC Magazine*, and KAREN J. BANNAN and ANGELA HICKMAN are staff writers. SHANE MOONEY, KATHY YAKAL, and BERNARD H. YEE are freelance writers and frequent contributors to the magazine. MICHAEL E. RYAN was the associate editor in charge of this story.

AT HOME
Holiday Gift Guide

the same idea back, only this time it plays out in 3-D. Game play is similar to that in Microsoft's *Hellbender*. Although you have to make some tactical decisions, *Scorched Planet* is, true to its roots, an action-packed shoot-'em-up.

Shattered Steel (\$40; Interplay Productions, 800-468-3775, www.interplay.com). Oh, if only we owned stock in the big mech genre! Interplay's mech game is more action-oriented than *MechWarrior 2* and packs quite a graphical punch. The terrain is impressive, and the weapons effects are pretty impressive as well. But don't let the big robots in this game fool you. *Shattered Steel* is more like a ground-based *Descent* than a new *MechWarrior 2*.

Tomb Raider (\$50; Eidos Interactive, 415-616-2022, www.eidosinteractive.com). Watch out, Duke Nukem 3D and Quake: Another hot action game is on its way. *Tomb Raider* is a spectacular 3-D game in which you guide pistol-packing heroine Lara Croft through a breathtakingly rendered tomb. The graphics in this game are stunning, and the game play is more sophisticated than simply "kill or be

killed." *Tomb Raider* is a good bet to reach best-seller status.—Bernard H. Yee

ADVENTURE

Ace Ventura: The CD-ROM Game (\$50; 7th Level, 800-884-8863, www.7thlevel.com). This high-resolution, well-produced title brings Ace Ventura's attitude and swagger to life on the PC. As Ace, you'll take on your toughest case, traveling to 30 exotic locations around the world in search of clues to unravel an animal-crime ring. You'll have to solve mind-bending problems and maneuver through fast-paced scrolling action sequences in this one.

Amber: Journeys Beyond (\$45; Graphic Simulations Corp., 800-580-4723, www.graphsim.com). Set in a haunted Victorian house in North Carolina, this title draws the gamer into a quest to find a missing colleague: Roxy, who it seems became fragmented and scattered across the supernatural realm in an earlier attempt to step "beyond." This game uses a combination of lifelike imagery, subtle environmental sounds, a compelling soundtrack, and thoroughly developed characters



and stories to create a truly eerie adventure.

Circle of Blood (\$50; Virgin Interactive Entertainment, 800-874-4607, www.vie.com). Not merely an adventure game, *Circle of Blood* is more of an animated, cinematic extravaganza. Rich with hand-drawn animation from some of the world's most talented artists, this title puts you in the middle of a dangerous mystery surrounding a cryptic medieval manuscript. The animation and lush environments help immerse you in the compelling story as you fight off a group of megalomaniac Fascists plotting to rule the world using the secrets contained within the artifact.

Clandestiny (\$50; Trilobyte, 800-968-2983, www.tbyte.com). Mix together a healthy dose of Scottish lore, challenging puzzles, and nearly 40 minutes of movie-quality animation, not to mention plenty of humor, and you've got *Clandestiny*. You must guide Andrew MacPhiles and his fiancée Paula through creepy Castle MacPhiles in order to defeat a deadly curse that has haunted the family for generations.

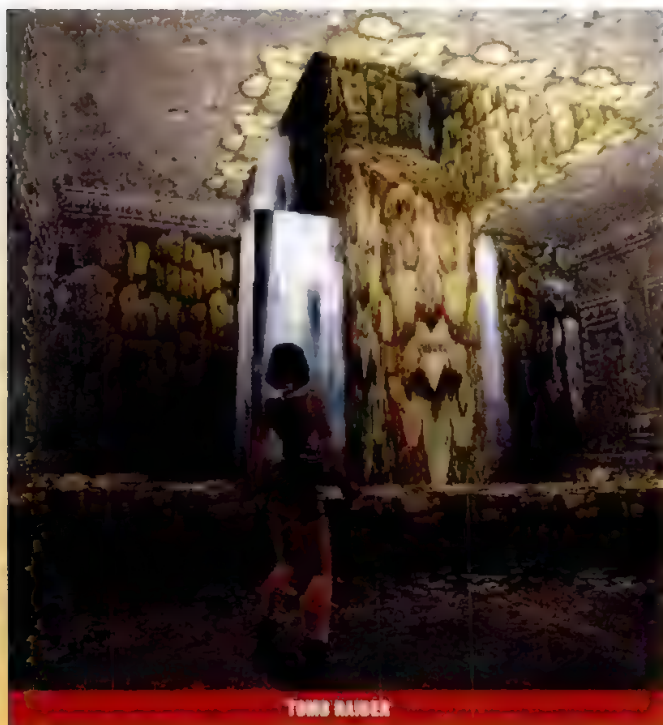
The Lost Files of Sherlock Holmes: Case of the Rose Tattoo (\$50; Electronic Arts, 800-245-4525, www.ea.com). Cast as Sherlock Holmes, you take on a case for your own brother as he tries to track down the party responsible for stealing sen-

sitive Ministry of Defence documents. Through tons of digitized video sequences, you will need to unravel several connected crimes, defend England's national security, and protect the honour of the royal family.

Meridian 59 (\$40 plus online charges; 3DO Corp., 800-336-3506, www.3do.com/meridian/). Fire up your Internet connection and step into the amazing world of *Meridian 59*. This graphical MUD (multiuser dimension) is an online community where swords and sorcery rule the land but where good citizenship counts for much. You can interact with hundreds of other users in this role-playing game and even embark on quests or join guilds in cyberspace.

Nemesis: A Wizardry Adventure (\$50; SirTech Software, 800-447-1230, www.sir-tech.com). This very impressive and graphically stunning title proves that a good role-playing adventure doesn't have to be complicated. Forget the manual; beginners should have no problem getting started in this first-person-perspective, real-time game. Battle against more than 40 3-D-modeled creatures as you wend your way through a carefully unfolding plot that becomes more and more intriguing as you solve each of the game's logic puzzles.

The Neverhood (\$55; Dreamworks Interactive, 800-426-9400, www.dreamworksgames.com). In this fas-



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All Windows 95 and Direct 3D tests conducted on Sept. 6, 1998 by Matrox Graphics Inc. on a Gateway P5-100 configured with Intel P5-100MHz, 16MB of EDO RAM with 256K cache, Matrox Mystique, Diamond Stealth 3D 2000XL and ATI 3D Xpress64K were configured with 2 MB of memory for the P5-100 test using their release 3.12.0 (3109740) and 2.22 respectively for Windows 95. WinMark 98 1.0 tests conducted at 1024 x 768 resolution with 8 bit and 24 bit color at 75Hz refresh using target frame times under Windows 95. ATI has not released Direct 3D drivers for the 3D Xpress64K therefore drivers provided on the Microsoft DirectX 7.0 SDK were used. * Matrox's True Motion Microsoft Clip-Matrox's True Motion was tested as first person view, with disabled all, map off, sky texture on, horizon on, window effects on, image quality high, texture map/mipmap complete, shadow removal, surrounding on, top texture and gamma off. Test conducted at full screen 640 x 480 x 16 bit. Direct 3D tests done using Tunnel test the DirectX 7.0 SDK. Diamond Stealth 3D 2000XL and ATI 3D Xpress64K tests were conducted at 612 x 384 x 16 bit while Matrox Mystique tests were conducted at 640 x 480 x 16 bit based on Diamond Stealth, perspective viewport rendered, peaks compiled, 16-bit per pixel color, deferred rendered polygons. (1) Game tested when executed on ATI 3D Xpress64K.



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Holiday Gift Guide



cinating clay-animation adventure, you play a hero named Klaymen who finds himself in The Neverhood, a land of terrifying creatures, extraordinary machines, and mysterious artifacts, featuring dozens of stunning, photo-realistic environments (created from over 3 tons of clay). You must save The Neverhood by navigating Klaymen through a twisted plot of ancient secrets, witty inventions, and monstrous puzzles.

The Pink Panther's Passport to Peril (\$40; Wanderlust Interactive, 212-965-9770, www.wanderlust.com). Your mission, should you choose to accept it, is to help that infamous master of disguise, the Pink Panther, as he goes globe-trotting to such sites as the Pyramids, Stonehenge, and the Taj Mahal while unraveling a sinister yet silly plot. You'll have to collect clues, pick up and pocket items to solve several puzzles, and discover the wonders of each country's history and culture using your PDA (Pink Digital Assistant).

PYST (\$15; Parrot Interactive, 800-910-2696, www.palladiumnet.com). Spoofing the name and setting of the most popular adventure game of all time (we'll let you guess which one), this hilarious CD-ROM looks at the familiar but frustrating island in a whole new light. Now that 4 million gamers have trampled through it, the glorious scenery is gone (as are the impossible puzzles and

spacey, New Age music). Guided by John Goodman, you travel through ten familiar scenes filled with clever animations and video and audio clips. It's not really a game, but it is a lot of fun.

Shadoan (\$30; Interplay Productions, 800-468-3775, www.interplay.com). Intriguing puzzles and wonderful animations combine in this amazing, family-oriented fantasy adventure. Hidden puzzles, multiple levels of difficulty, and a rich soundtrack help bring the fantastical and magical world of Shadoan to life in this compelling game.

SPQR (\$50; GT Interactive, 800-610-4847, www.gtinteractive.com). Based on a popular online game, this title/history lesson lets you wander the streets of a virtual ancient Roman city. You must journey through this wonderfully rendered city as you attempt to unlock the mysteries hidden beneath the town—which was on the brink of tremendous scientific discoveries before a sudden decline.

Stay Tooned (\$40; Funnybone Interactive, 800-545-7677, www.stay-tooned.com). Those naughty Saturday morning cartoon characters have escaped the television and are hiding all over your apartment building. You'll have to wander through over 50 intriguing environments as you search for the missing

remote control that can send them back. All the while, you'll find yourself engaged in over 30 games, 5 of which use true 3-D imagery to bring objects to life (funky red and blue glasses are included, of course).

TimeLapse (\$65; GTE Entertainment, 800-483-8632, www.im.gte.com). Embark on an intriguing puzzle-solving adventure as you discover the secret behind Atlantis and other ancient civilizations, including Easter Island and the Egyptian, Mayan, and Anasazi worlds. You'll unravel the mysteries of these lost civilizations by exploring exotic locations and finding the links between various patterns, numbers, sounds, and symbols as you move toward Atlantis, your ultimate destination.

Titanic: Adventure out of Time (\$49.95 list; GTE Entertainment, 800-483-8632, www.cyberflix.com). A painstakingly recreated, historically accurate cybermodel of the ill-fated ship serves as the backdrop to this adventure game, in which you play a British secret agent sent on a mission

of the road as you race a high-speed stock car against the clock or against your virtual competitors. All the thrills of arcade racing are in here, even the crashes (which can be more fun than winning the race).

Deadly Tide (\$55; Microsoft Corp., 800-426-9400, www.microsoft.com). More than just another shoot-'em-up arcade thriller, this five-CD-ROM game offers some beautiful 3-D graphics and overwhelming action sequences. You play the heroic commander of an underwater hydro-fighter desperately working to defeat aliens who are trying to turn the Earth into a watery grave.

Magic: The Gathering (\$60; MicroProse Software, 800-695-4263, www.microprose.com). Based on the immensely popular card game of the same name, Magic brings all the fun and strategy of the original to your PC but adds a ton of new duels, monsters, and magic. Prepare yourself to be enthralled, but be sure to read the manual carefully; the learning curve is pretty steep.



to prevent World War I. You'll have to interact with over 25 other passengers, and a conversation with one of them will affect the others. —Shane Mooney

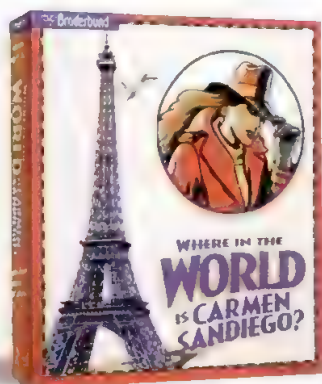
ARCADE/CLASSIC

Daytona U.S.A. (\$45; Sega Entertainment, 888-734-2725, www.sega.com/segapc). This latest version of Sega's classic arcade driving game will provide you with hours of driving excitement. You are the master

NeoHunter (\$40; Virgin Interactive Entertainment, 800-874-4607, www.vie.com). As this nicely animated adventure begins, you drop right into the middle of an intensive search for a deadly assassin. You interrogate bad guys and solve lots of puzzles while finding clues along the way. What's more, you get to choose exactly how difficult you want your quest to be—a particularly gratifying touch for the beginning or casual gamer.



Her passport is blank.
But her mind is well-traveled.



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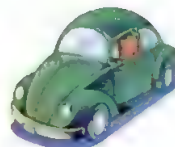
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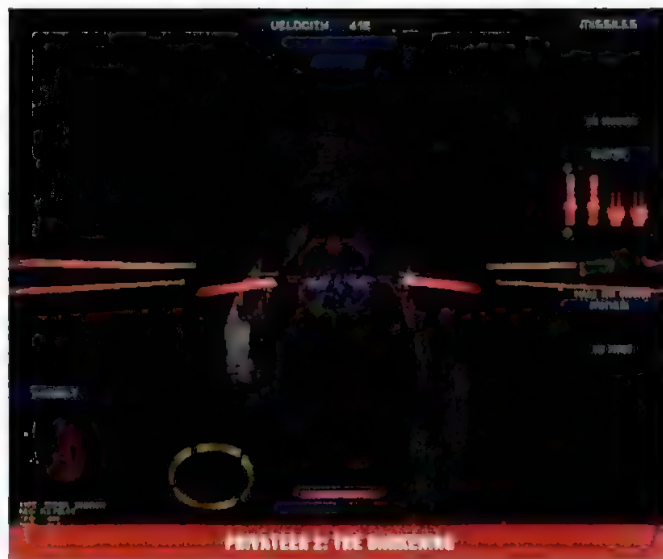
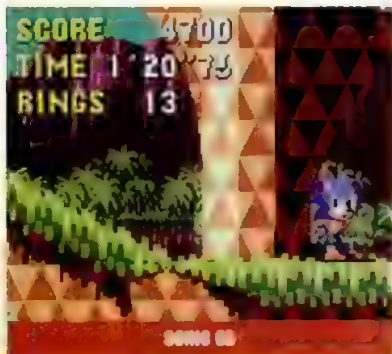
Sonic CD (\$35; Sega Entertainment, 888-734-2725, www.sega.com/segapc). Sonic the Hedgehog makes his first of two appearances in this story by invading your PC in a race to rescue his friend and save the world. But with more than 60 levels to play and a supercool soundtrack, this is more than just your basic console-to-PC port.

Ultimate Yahtzee (\$25; Hasbro Interactive, 800-638-6927, www.hasbro.com). The PC version of this classic game offers five different versions: classic, pyramid, painted, battle, and the ever-popular triple. Each game can be played in under 15 minutes, perfect for those in the mood for a quick adrenaline rush. Although the graphics are good, the game's true strength is the actual game play, which is a blast. —Karen J. Bannan

SIMULATIONS & SCI-FI

Armored Fist 2—M1A2 Abrams (\$60; NovaLogic, 818-880-1997, www.novalogic.com). Tank simulations are on the comeback trail, and Armored Fist 2 is at the vanguard of this movement. Featuring a more advanced graphics engine and more advanced texture mapping than the original along with multiplayer support, Armored Fist 2 should make quite an impact.

Comanche 3 (\$60; NovaLogic, 818-880-1997, www.novalogic.com). Another NovaLogic title, this one is an all-new incarnation of the helicopter simulation classic. Using the same engine as Armored Fist 2, Comanche 3 is an action-oriented



simulation with lots of cool graphic effects. Translucent smoke, shifting cloud patterns, multiple resolutions, and intricately animated objects contribute to the game's quality.

JetFighter III (\$70; Mission Studios, 800-468-3775, www.missionstudios.com). Designed to provide all the thrills of real air combat without being too difficult to learn, JetFighter III is a fun game with very good graphics, including some extremely detailed terrain. You'll get to fly interesting missions in Chile, Colombia, Cuba, and even Florida as you pilot your F-22 for the United Nations.

NATO Fighters (\$20; Electronic Arts, 800-245-4525, www.ea.com). This add-on disk for Advanced Tactical Fighters includes 40 new missions and four new planes, along with a handful of new bombs and missiles. Part of the Jane's Combat Simulations series, NATO Fighters is also packed with photos and technical data on the planes and weapons featured in the game.

Privateer 2: The Darkening (\$60; Origin Systems, 800-245-4525, www.ea.com/origin.html). Taking the free-booter theme of the original Privateer and mixing it with an even more impressive graphics engine than we saw in

Wing Commander IV, Privateer 2 looks like one of the season's best. Take your own path through the galaxy or follow the plot, make money by trade or by force—it's all up to you in this eagerly anticipated, impressive new title.

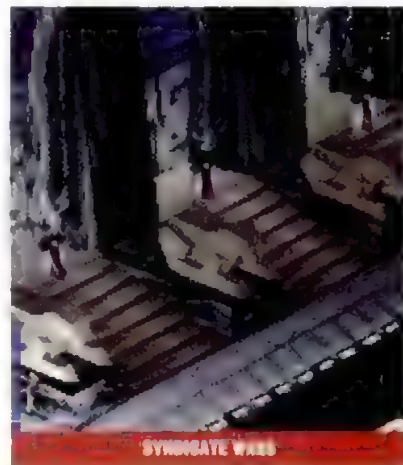
Wing Commander: The Kilrathi Saga (\$40; Origin Systems, 800-245-4525, www.ea.com/origin.html). Wing Commander I, II, and III—classics all—are brought together in this nostalgic package. The first two installments may not look impressive next to the third, but they're still a blast (and are actually playable on a Pentium system, unlike the original, 386-based versions, which ran way too fast).

X-Wing vs. TIE Fighter (\$55; LucasArts Entertainment, 800-985-8227, www.lucasarts.com). Star Wars fans everywhere: Your prayers have been answered. This title unites LucasArts' outstanding space-combat games and adds a spectacular graphics engine along with (at long last) real multiplayer capabilities. Whether you choose to fight for the Rebellion or the Dark Side, you're sure to take part in some thrilling dogfights as you fly through this one. —Michael E. Ryan

SPORTS

ABC's Monday Night Football (\$45; OverTime Sports, 800-900-9234, www.otsports.com). Are you ready for some football? If so (and if you have a powerful PC), you'll get a kick out of this feature-laden recreation of ABC's long-running series. Al, Dan, and Frank are all in the game, as are Chris Berman and Lynn Swann. The graphics are excellent and the game play is fun, though the game is rather resource-intensive.

Front Page Sports: Golf (\$60; Sierra On-Line, 800-757-7707, www.sierra.com). Beautifully rendered scenery and fairly realistic game play highlight Sierra's entry into the golf simulation market. The game includes an optional (and very difficult to master) swing-control feature in which you must move your mouse back and forth in precise, well-timed motions.



NBA Full Court Press (\$45; Microsoft Corp., 800-426-9400, www.microsoft.com). A truly impressive game in many respects, NBA Full Court Press offers all 29 NBA teams, motion-captured player animations, and multiplayer capabilities. For that extra dose of realism, play-by-play commentary is supplied by Kevin Calabro (voice of the Seattle Supersonics).

NCAA Championship Basketball (\$60; GTE Entertainment, 800-483-8632, www.im.gte.com). Another

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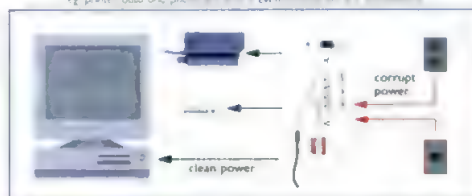
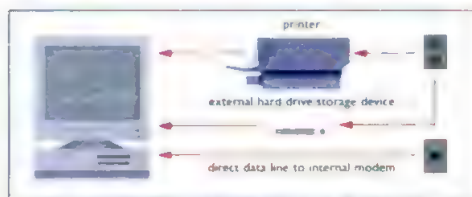
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900	\$529	47 min.
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cool hoops game, but one with more emphasis on strategy and coaching than on high-twitch action, this title recreates the look and feel of March Madness in spectacular fashion. You get to guide a team through an entire season or just the tournament, as well as battle it out with other schools for the nation's top recruits.

Total Control Football (\$50; Philips Media, 800-883-3767, www.media.philips.com). The name of this game is certainly not misleading: You get to control everything as you take your NFL franchise through a grueling 16-game season. Draft and trade players, chew out your coaches, and adjust your team's salaries as you try to build a championship franchise. If you're an

action fan, you'll still get your fix, since you also get to take charge of the team on the field.—MER.

STRATEGY

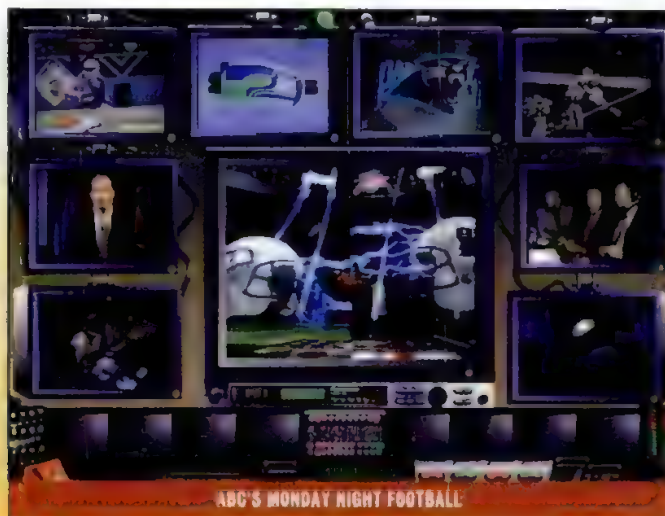
Blood & Magic (\$40; Interplay Productions, 800-468-3775, www.interplay.com). **Blood & Magic** places you in the role of a wizard who must summon Acolytes from the Forgotten Realms to aid your conquests. Of course, you'll have to battle for control of the various portals required for summoning in this *Advanced Dungeons and Dragons* game.

Gene Wars (\$60; Electronic Arts, 800-245-4525, www.bullfrog.co.uk/). Your job is *supposed* to be the cleaning up of a planet ravaged by years of warfare. However, your old foes are still on the planet, and you have no weaponry (thanks to the holier-than-thou efforts of some alien race) So you'll have to invent some new, biologically engineered warriors to wipe out your foes in this humorous title

Lords of the Realm II (\$60; Sierra On-Line, 800-757-7707, www.sierra.com). Combining the best features of *Warcraft II* with some *Civilization II*-style management, this game challenges you to conquer medieval England and claim the throne. Good graphics and addictive game play help make *Lords of the Realm II* a fine addition to the ever-growing real-time strategy crowd.

Master of Orion II: Battle at Antares (\$60; MicroProse Software, 800-695-4263, www.microprose.com). The eagerly anticipated sequel to one of the most popular strategy games ever, *MOO II* (as it is affectionately called) is a game of galactic exploration, colonization, and conquest. All-new graphics and enhanced space combat highlight the return of a classic.

M.A.X. (\$40, Interplay Productions, 800-468-3775, www.interplay.com). Yes, a real-time strategy game, and one that is a combination of *Command*



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& Conquer weaponry and Warcraft II game play. Derivative though it may be, M.A.X. is nevertheless an enjoyable, challenging game, with a few twists and features all its own.

Syndicate Wars (\$60; Electronic Arts, 800-245-4525, www.bullfrog.co.uk/). A title full of euphemisms, Syndicate Wars is a dark, futuristic game in which you must ventilate the opposition and persuade neutrals to join your cause. The 3-D game map is very detailed and the action fast and furious as you battle to decide the future of the planet.

Wooden Ships & Iron Men (\$45; Avalon Hill Game Co., 800-999-3222, users.aol.com/ahgames/avalon.html). Take to the high seas in this engaging war game. The game's design makes for some lifelike battles as you replay battles such as Trafalgar or create your own (to see who would have won a broadside duel between Captains Hornblower and Aubrey).—MER



Gadgets and Gizmos

EasyPhoto Drive (\$200; Storm Technology, 888-438-3279, www.easyphoto.com/storm/). Storm Technology's cool little EasyPhoto scanner is now available as an internal drive. EasyPhoto Drive fits into a 5.25-inch drive bay and lets you easily scan in photos (up to 5 by 7 inches) and edit them using the included EasyPhoto Workshop software.

kidDraw (\$130; kidBoard, 800-926-3066, www.kidboard.com). This dig-



MINDDRIVE

itized drawing tablet is specifically designed for children. The tablet includes a stylus and a copy of Davidson & Associates' Kid Works 2 drawing and creativity software. The product also has a nifty overlay that lets kids trace their favorite pictures.



SURFMAN

Microsoft SideWinder Game Pad (\$40; Microsoft Corp., 800-426-9400, www.microsoft.com). This programmable game controller offers eight buttons, an eight-direction thumb pad, and the Game Device Profiler software, which lets you assign special commands to each button for your favorite games. Also, the SideWinder Game Pad has a unique pass-through port that lets you daisy-chain up to four pads together on a single PC.

MindDrive (\$150; The Other 90% Technologies, 800-706-0456, www.other90.com). A device that lets you control your PC with your mind? Yes, that's right. This little device fits onto your finger and reads bioelectric signals through your skin, transmitting the data to any MindDrive-enabled application (a game called Mind-Skier is included with the product).

SurfMan (\$100; Logitech, 800-231-7717, www.logitech.com). With this sleek wireless device, you can sit back and surf the Internet as comfortably as you surf your cable channels. SurfMan includes a little thumb-operated trackball and three buttons, which can provide one-click access to many Internet-specific commands. This product could spawn a whole slew of "mouse potatoes."—MER

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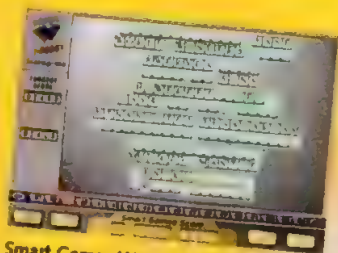
—Computer Gaming World

Everybody's raving about the best-selling *Smart Games Challenge 1*. It's fun for your brain, not your trigger finger. Now available for both MAC and PC, it features over 300 games that stretch your mind. From wordplay wonders and strategy sticklers to perception puzzlers, *Smart Games Challenge 1* is brain-powered fun!

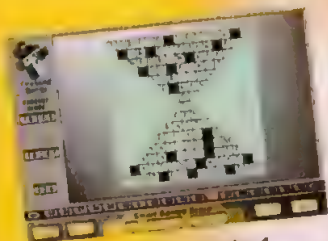
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Smart Games Word Puzzles 1
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Children's Software

AGES 3 TO 8

Fisher-Price Learning in Toyland (\$20; Davidson & Associates, 800-545-7677, www.davd.com). Learning in Toyland is a playland of six games, all of which combine good sound and graphics to entertain and educate. Besides learning how to match shapes and colors and how to follow instructions, kids can print out many of their creations for a place of honor on the refrigerator.

The Giggibone Gang World Tour (\$30; Headbone Interactive, 800-267-4709, www.headbone.com). A visually impressive title, The Giggibone Gang World Tour lets kids learn about life in ten different countries. In each country, the Gang's five members will teach kids a variety of local facts, including a fable and a traditional game.

Grandma Ollie's Morphabet Soup (\$30; KinderActive, 888-438-6543,

JumpStart Kindergarten Reading (\$55; Knowledge Adventure, 800-542-4240, www.adventure.com). Mr. Hopsalot takes your preschooler on visits to six of his relatives in an attempt to find clues that lead to a treasure in his carrot patch. The clues are won by playing games that teach basic reading skills, like distinguishing vowels from consonants.

Just Me and My Mom (\$40; GT Interactive, 800-610-4847, www.gtinteractive.com). Just Me and My Mom is another Little Critter story by Mercer Mayer. In this wonderfully engaging title, Little Critter, together with his funny pet frog and his mom, spends a day in Critter City visiting the aquarium, the Museum of Natural History, and other places (and each screen is full of clickable objects).

Kidsongs Musical Mystery (\$30; TerraGlyph Interactive, 800-929-9844, www.terraglyph.com). Another



Mega Math Blaster (\$45; Davidson & Associates, 800-545-7677, www.davd.com). An updated version of an educational classic, Mega Math Blaster is a fun and funny comic adventure in which you play math games to rescue Spot, Blaster-naut's sidekick, from the evil villain, Brain Drainer. With 42 skill levels and more than 50,000 math problems, you should not have to worry about repetition with this title; this is a game that will keep up with your child's developing math skills.

Pajama Sam in No Need to Hide When It's Dark Outside (\$40; Humongous Entertainment, 800-499-8386, www.humongous.com). In this wonderfully elaborate and funny game, Sam needs to conquer his fear of the dark. But first, he needs to find his misplaced superhero outfit: his cape, his

mask, and his lunch box. Then he's ready to head into the closet to do battle with Darkness. You and your children will both enjoy the challenges Sam encounters along the way, as well as the surprise ending.

Putt-Putt and Pep's Balloon-O-Rama (\$15; Humongous Enter-

tainment, 800-499-8386, www.humongous.com). Our favorite car, Putt-Putt, is spending his day springing Pep into the sky to burst some bright balloons—and he needs you to help. This Breakout-style game includes 120 levels of arcade action, hidden bonus rounds, and even a section that lets you create your own impossible levels.

Reader Rabbit's Interactive Reading Journey 2 (\$75; The Learning Co., 800-227-5609, www.learning.com). Come learn to read with Reader Rabbit and his friends. This enjoyable and educational CD-ROM offers a unique twist: You can read along as the stories are read by Booker Frog, or you can record yourself reading them aloud and play back your own narration.

Sonic's Schoolhouse (\$35; Sega Entertainment, 888-734-2725, www.sega.com/segapc). Sega's famous hedgehog is back, but this time Sonic's adventures take him into a schoolhouse. In this first person-perspective game, Sonic helps kids practice reading, spelling, and math skills in four classroom settings. Getting the correct answers earns you gumballs and "passes" to recess and field trips.

A Story About Me: In the Backyard (\$40; Philips Media, 800-883-3767, www.media.philips.com). This enjoyable title allows you to



www.kindernet.com). Grandma Ollie is in the kitchen and cooking up seven educational meals, including Amazing Alphabet Soup and Multiple Meanings Moussaka. Based on a real-life grandmother and teacher, the character in this CD-ROM teaches alphabet skills, spelling, vocabulary, and early reading skills.

er kids' game based on a TV show, **Kidsongs Musical Mystery** challenges players to solve the mystery of Professor Major Chord and his Harmonious Orchestra's many missing musical instruments. Kids are able to explore eight musical lands and three secret worlds in this vibrant title.

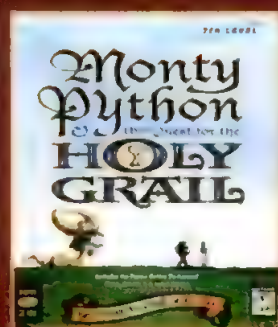


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scan in your own photos and use them to customize several wacky adventures. With this program, you can create your own tales that include brilliant graphics, sound effects, and even your own voice, providing hours of after-dinner theater for the whole family. —*Mary E. Behr*

AGES 8 AND UP

Amphibians & Reptiles (\$30; ICE, 416-868-6423, www.iceinc.com). Another impressive title from ICE, *Amphibians & Reptiles* is a fairly exhaustive reference title that covers six different habitats and the slippery or slithery creatures that live in them. The CD-ROM comes with a book and includes some vibrant photography and illustrations along with a quiz and some interesting activities for kids.

The Babysitters Club Friendship Kit (\$40; Philips Media, 800-883-3767, www.media.philips.com). Based on the popular *Babysitters Club* books by Ann M. Martin, this title provides a

.com). Looking for a fun, safe online activity for kids? Look no further than *Castle Infinity*. As it turns out, the dinosaurs aren't actually extinct, and this castle is their last refuge. But it's under attack by some nasty monsters, and the dinosaurs need help from your kids to drive the monsters out by exploring and completing several tasks in the game's arcade-style, chat-room atmosphere.

Corel ChemLab (\$65; Corel Corp., 800-772-6735, www.corel.com). With *Corel ChemLab*, budding scientists can learn the basics of chemistry without filling your home with strange odors—or worse. The program offers a virtual lab full of equipment to conduct basic experiments, either canned or wholly original. The lab can be made to look like a dungeon or a modern facility and comes equipped with scales, heaters, Geiger counters, and a full range of lab glassware.

Fractured Fairy Tales: The Frog Prince (\$30; SegaSoft, 800-734-



host of fun and useful activities for young women. Among the program's many sections you'll find a scheduler, a name and address book, a journal, and a greeting card maker. You can even interact with members of the *Babysitters Club* (in fact, you'll get a letter from one of them every day).

Castle Infinity (\$40; Starwave Corp., 800-457-8646, www.castleinfinity

2763, www.segasoft.com). Based on the popular segment from the *Rocky and Bullwinkle* cartoons, this smoothly animated program tells the tale of a frog who's been turned into a prince. Along the way, you can stop to play any of eight games, such as one in which you reassemble suits of armor, with up to three levels of difficulty each. And you might even run into some old friends making cameo

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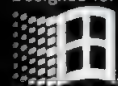


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appearances, including Rocky and Bullwinkle themselves.

Goosebumps: Escape from Horrorland (\$45; DreamWorks Interactive, 800-426-9400, www.dreamworksgames.com). R. L. Stine's Goosebumps adventures come eerily to life in this highly interactive point-and-click adventure. Your mission is to escape from a ghastly theme park, rescuing Lizzy, Luke, and Clay. You'll have to find clues, gather valuable items, and solve puzzles. Smooth-scrolling graphics, video clips, and familiar voices (from such stars as Jeff Goldblum and Isabella Rossellini) help set the scene in this scary tale.

Let's Talk About Me! (\$30; Simon & Schuster Interactive, 888-793-9972, www.aboutme.com). This title aims to help young women through the awkwardness and confusion of adolescence with a variety of fun and informative segments. Each segment is designed to encourage better understanding of the player's life, self-image, personality, and future. Also, the title includes interviews with many well-known women, such as Marlo Thomas and Dianne Feinstein, each talking about her own difficulties growing up.

Microsoft Creative Writer 2 for Windows 95 (\$35; Microsoft Corp., 800-426-9400, www.microsoft.com). A word processor with an interface that kids can both understand and enjoy, this impressive title doesn't just

let kids write, it encourages them to do so. The product operates much like Microsoft Word, albeit with different icons and templates and a much simpler tool set (which includes writing, page formatting, drawing, and idea-generation tools). Kids can even design a Web page with this one.

Pyramid: Challenge of the Pharaoh's Dream (\$40; McGraw-Hill Home Interactive, 800-937-4663, www.mhhi.com). Enter the world of ancient Egypt in this educational game, and you can fly through the Nile Valley on your quest for the secret of how to build a pyramid. Terrific graphics and seven levels of activity provide hours of entertainment and learning as you interact with historical characters and learn the culture and technology of the day.

Scholastic's The Magic School Bus Explores the Age of Dinosaurs (\$45; Microsoft Corp., 800-426-9400, www.microsoft.com). Dinosaurs are an ever-popular topic with kids, so put your kids on the (equally popular) Magic School Bus and send them into the past to search for dinosaurs. Kids get to search through the past and take pictures that will fill up the schoolteacher's album of photographs. Along the way they will get to play several multilevel games and learn about prehistoric times, fossils, and much more.

SimPark (\$40; Maxis, 800-336-2947, www.maxis.com). In this challenging

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AT HOME
Holiday Gift Guide

game, you play a park ranger who (along with your trusty, right-hand frog Rizzo) must construct a park whose ecosystem matches the climate and the other living things around. SimPark, besides being an entertaining way to spend many hours, can be a real eye-opener that points out just how delicate the balance of nature can be.

SimTunes (\$35; Maxis, 800-336-2947, www.maxis.com). Aspiring musicians or no, kids (and parents) are likely to smile at their introduction to SimTunes. This very innovative title was inspired by a permanent computer exhibit (called Musical Insects) at the San Francisco Exploratorium. The entire screen is your musical canvas, and you play notes by guiding one of four little bugs over colored dots, each color representing a different note. A wonderful title, SimTunes is fun and very, very addictive.

Someone's in the Kitchen! (\$35; DreamWorks Interactive, 800-426-9400, www.dreamworksgames.com). Come into this title's animated, singing kitchen and you can cook up all sorts of fun while learning about kitchen tools, foods, and cooking techniques. You can create meals from a cookbook or on your own, testing your culinary skills on a comical taste-testing dog, who also does some of the stirring and fetching chores. Recipes can even be printed out for real-world meal preparation, so kids can actually taste the dishes presented in the program.

The Time Warp of Dr. Brain (\$40; Sierra On-Line, 800-757-7077, www.sierra.com). Back for his fourth adventure, Dr. Brain has gotten himself lost in time and you have to bring him back to the present by solving puzzles that challenge intuitive skills and hand-eye coordination. Colorful graphics, amusing voices and sounds, and endless twists and turns challenge both kids and adults (who will have a hard time giving up these puzzles to let the kids have their turn).

—Kathy Yakal

Productivity and Fun

Family Album Creator (\$45; Creative Wonders, 800-543-9778, www.cwonders.com). Your memories can really last a lifetime with this multimedia photo album. Using an intuitive interface (designed to look like a desktop), novice and experienced users can easily create photo albums to commemorate any occasion—complete with photographs, text, clip-art images, and sound and video clips.

Greetings Workshop for Windows 95 (\$30; Microsoft Corp., 800-426-9400, www.greetingsworkshop.msn.com). It's easy to capture personal moments in your own words with this home desktop publishing program. Create invitations, calendars, and announcements using the sample designs and text messages, or add some from your own imagination. And more content is always available from the Greetings Workshop Web site.

Net Explorations with Web Workshop (\$35; Sunburst Communications, 800-786-3155, www.nysunburst.com). Has the task of learning HTML coding given 8-year-old Jenny the blues? Web Workshop can help. This easy-to-use Web au-



thoring tool lets even novices easily create personal Web pages, complete with hypertext links, "mail to" functionality, and cool graphics corresponding to the program's three themes: Cool School Stuff, Around the World, and Just for Fun.

Picture It! (\$80; Microsoft Corp., 800-426-9400, www.microsoft.pictureit.com). A fairly powerful imaging tool, Picture It! lets you create collages, cards, and calendars using your favorite photos. You can scan in your pictures through any Twain-compliant scanner or import them using a digital camera or Flash-Pix CD. Then resize, rescale, and fix common problems (such as red eye). You can print your creation on any ink jet printer, or even send your work off to an online Kodak photo shop, which will send you prints on Kodak paper.

Print Artist 4.0 (\$60; Sierra On-Line, 800-757-7707, www.sierra.com). Do stick figures push your drawing and design capabilities to the limit? This program can help. Aspiring graphics designers can use Print Artist 4.0 to fashion unique greeting cards, postcards, calendars, and certificates from a database of more than 10,000 images, 300 typestyles, and 1,000 different layouts.

Steven Spielberg's Director's Chair (\$35; Knowledge Adventure, 800-542-4240, www.adventure.com). Learn how to write your own movie scripts, create special effects, and even shoot and edit your own film (complete with sound and music) with this filmmaking game. Under the expert tutelage of Spielberg himself, you must produce a blockbuster, on time and under budget. Jennifer Aniston

and Quentin Tarantino play starring roles, comedians Penn and Teller make appearances, and, of course, the award-winning director of *E.T.* lends a guiding hand.

The Tick: The Tick vs. The Uncommon Cold (\$10; Inverse Ink, 800-771-1344, www.inverse.com). Load up this CD-ROM and you can follow the adventures of the world's most bizarre, 400-pound, blue crime fighter. Using images from the television series of the same name, this fun, animated comic book tells the tale of the Tick's struggle against the evil Thrakkozog. As The Tick would say, "Spoon!" —Angela Hickman





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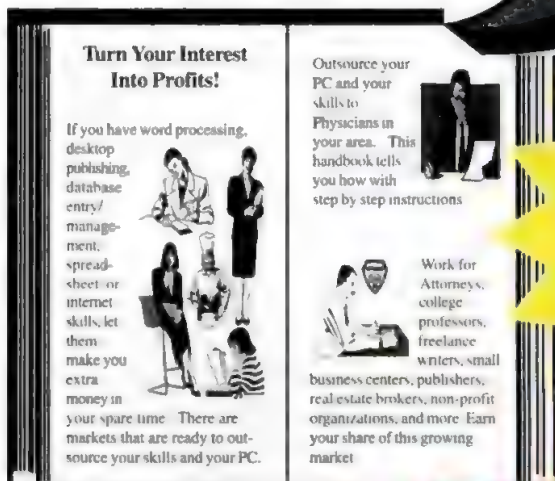
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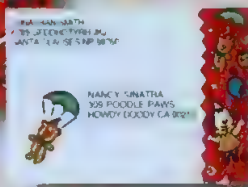
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ABC Newslinks: The Current Events Resource (\$45; Creative Wonders, 800-543-9778, www.cwonders.com). For those who want up-to-the-second information about current events, Creative Wonders' ABC NewsLinks: The Current Events Resource can be an invaluable tool. Hosted by ABC anchor Forrest Sawyer, this title brings you the latest stories from the ABC News site on America Online. The product then automatically links those stories to background data on the CD-ROM, where users can find geographical, economical, historical, and political information. ABC Newslinks also includes interactive time lines and biographies of more than 100 newsmakers.

The Atomic Files (\$35; L3 Interactive, 800-644-2823, www.learningcube.com). This is a fascinating and well-organized CD-ROM that covers everything from the initial development of the hydrogen bomb to present-day events. With stylish animation and graphics, as well as more than 40 minutes of video (via the cool Learning Cube interface), The Atomic Files presents information in such an intuitive fashion that you almost forget that you are learning.

Compton's Interactive Encyclopedia 1997 (\$50; SoftKey International, 800-227-5609, www.comptons.com). The 1996 edition of this multimedia encyclopedia was our Editors' Choice, and the 1997 version looks even better. With more than 37,000 articles, a powerful search engine, and hundreds of photographs and audio and video clips, this reference work is a solid, reliable resource. New monthly online updates and Web links help round out the features set.

Microsoft Encarta 97 Encyclopedia, Deluxe Edition (\$80; Microsoft Corp., 800-426-9400, www.microsoft.com). Not to be outdone, Microsoft Corp. offers the comprehensive Microsoft Encarta 97 Encyclopedia, Deluxe Edition, another solid multimedia encyclopedia. This two-CD-ROM title is chock-full of photos, illustrations, and audio and video clips to accompany its 31,000 articles. In addition, the product includes thousands of Web links and supports free monthly online updates. One neat new feature is the 360-degree view, which allows users to view a panoramic picture of famous sites (Times Square, for example).

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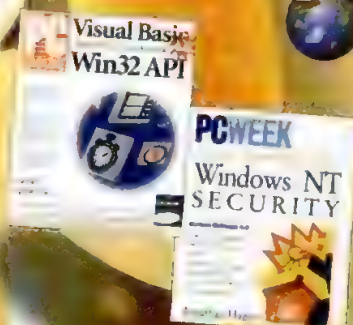
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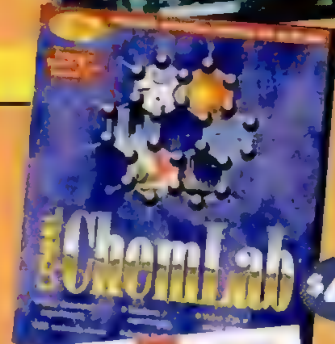


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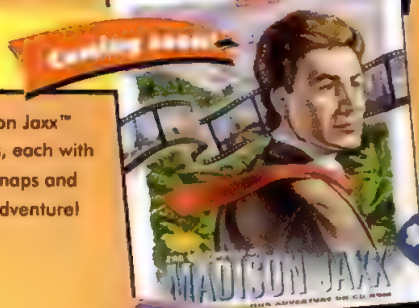


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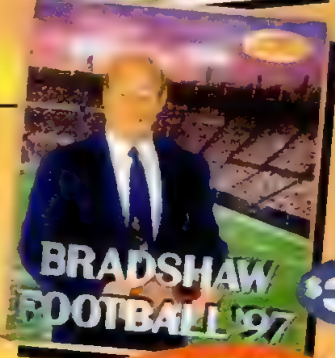
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Solar System Explorer (\$45; Maris Multimedia, 800-336-2947, www.maris.com). Those interested in surveying outer space from the ground should enjoy piloting their own virtual space missions with Solar System Explorer. This title is not a game, but it isn't a pure reference work either. It includes a wealth of astronomical data, along with some impressive graphics and calculating tools. Also, Solar System Explorer links to its well-organized Web site that offers even more information about space and the planets.

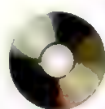
The Ultimate James Bond: An Interactive Dossier (\$40; MGM Interactive, 800-646-4800, www.mgmusa.com). That's right, Bond fans: an entire two-CD-ROM collection of info on the world's most famous secret agent. Bundled with a videotape of *Goldeneye* (the latest James Bond film), this comprehensive title includes photos, film clips, facts, and statistics (as well the obligatory collection of gadgets) from all 17 Bond films.



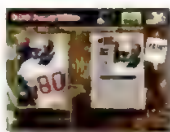
WordAce! Spanish Dictionary and Verb Conjugator (\$40; Transparent Language, 800-752-1767, www.transparent.com). This Spanish-language reference CD-ROM can be a valuable resource for anyone who wants to maintain or enhance a knowledge of the language. Users can choose to translate words

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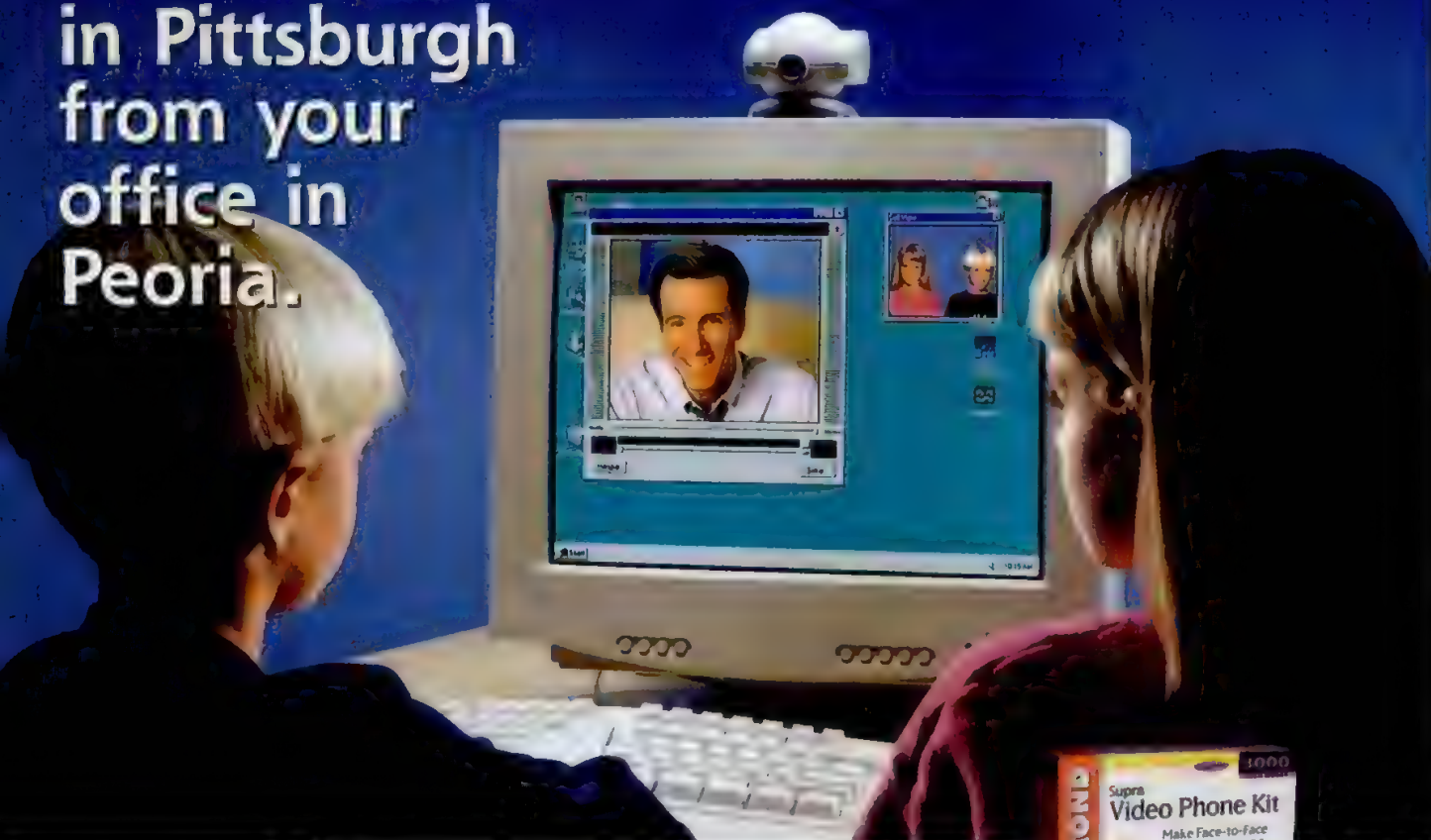
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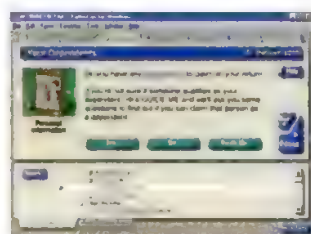
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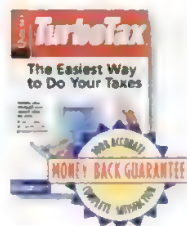
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*	ABIT Computers	232
049	Acclaim Entertainment	357
034	Acer America	90-92 @
*	Adaptec	51
*	Adaptec	348
*	Advanced Micro Devices	68-69 @
304	America Online	229
162	American Power Conversion	361-362
336	Arlington Computer Products	292-293
012	Austin Direct	119-121
351	Banner Blue Software	379
186	BayNetworks, Inc.	140 @
347	Broderbund Software	355
349	Broderbund Software	376-377
169	Bulldog Computers	273
329	CTX International	80
292	Caere Corporation	8 @
*	Canon Computer Systems	2-3 @
125	Casio	82-83
*	Compaq Computer Corporation	74-75
*	Compaq Computer Corporation	190-191
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*	Dell Computer Corporation	18-19
*	Dell Computer Corporation	72
*	Dell Computer Corporation	168-169
189	Diamond Multimedia Systems	364
098	Diamond Multimedia Systems	382
225	Earthlink	138 @

Reader Service No.	Advertiser	Page
004	Epson America	12-13
005	Epson America	198
*	Everex Systems	374
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*	Hewlett Packard	124-125
077	Hewlett Packard-Colorado Memory Systems	202 @
082	Hitachi PC Corporation	38-39
*	Hughes Network Systems	133
*	IBM Corporation	175
*	IBM Corporation	177
278	Insight Direct	298-299 @
*	Intel Corporation	11
*	Intel Corporation	53
166	Intercon Corp.	243
*	Intuit Software	383
106	Kingston Technology	194 @
019	L.A. Trade	272
367	LG Electronics USA	193 @
*	Leap Frog Labs	282-283
*	Lotus Development Corporation	78-79
*	Lotus Development Corporation	136-137
*	Lotus Development Corporation	167
*	Lotus Development Corporation	195
*	Lotus Development Corporation	197
*	Lotus Development Corporation	199
*	Lotus Development Corporation	201
*	Lotus Development Corporation	203
*	Lotus Development Corporation	221
006	Luckman Interactive	141 @
341	McAfee Associates, Inc.	188-189
299	McAfee Associates, Inc.	206-207
194	Macromedia	240 @
045	Magix	257
381	Matrox Graphics Inc.	352-353
283	MEGAHAUS	258-259 @
*	Megahertz Corp	116-117
391/138	Micro Mall/H.Co.	291
B56	Micro Solutions Computer Products	270 @
855	Micro Solutions Computer Products	294 @
*	Micro Warehouse	296-297
*	Micrografx	71
214	MicroHelp Inc.	84
120	Micron Electronics	26-27 @
119	Micron Electronics	86 @
164	Micron Electronics	109-114 @

Reader Service No.	Advertiser	Page
370	Micron Electronics	115 @
013	Micron Electronics	127-130 @
*	Microsoft	C2-C4, p1
010	Midwest Computer Works	274-275 @
107	NEC Technologies	154-155
155	NEC Technologies	222
327	NECX	271
266	Netgear	358
079	Nexar	171
263	Nimantics	181 @
394	Olivetti	182-183 @
047	PC Connection	284-285
080	PC Power and Cooling	88 @
192	PCs Compleat	286-287 @
092	PCs Compleat	288-289 @
268	PCs Compleat	290 @
*	Palm Computing Inc.	44
148	Primavera Systems	67 @
039	Princeton Graphic Systems	105 @
320	Prodigy Services	22-23
287	ProGen Systems	100 @
137	Protec Microsystems Inc.	132
007	Rainbow Technologies	235 @
*	RandomSoft, Inc.	366
*	S3 Incorporated	369
*	S3 Incorporated	371
*	S3 Incorporated	373
309	S.A.G./Storage Solutions	62-63 @
043	SPSS, Inc.	281 @
033	Samsung	176 @
057	Statsoft	43 @
335	Sun Microsystems	5 @
135	Sun Microsystems	248 @
201	Swan Technologies (see Zenith Data Systems Direct)	106-107
222	Symantec Corporation	143-146
001	Tektronix Inc.	96 @
368	Texas Instruments	15 @
246	Texas Instruments	98-99 @
070	The Forefront Group	244 @
312	The Forefront Group	246 @
021	Thunder & Lightning	123 @
379	Toshiba America	16-17 @
378	Toshiba America	164-165 @
*	US Robotics Inc.	159-162
051	USA Flex	280 @
085	Winbook	77 @
*	Xircom	25
303	ZD Net	245
124	ZD Press	230-231
178	ZD Press	378
201	Zenith Data Systems Direct	106-107

*No Reader Service#. Call Advertiser For Information.

Advertisers' Index PRODUCTS

Reader Service

No.	Company	Product	Page
ADD-ON BOARDS			
169	Bulldog Computers	Hardware, Peripherals	273
381	Matrox Graphics Inc.	Graphics Accelerator	352-353
*	S3 Incorporated	Descent II	369
*	S3 Incorporated	Megarace 2	371
*	S3 Incorporated	S3 Chips	373
BACKUP SOFTWARE			
162	American Power Conversion	Back-UPS Office	361-362
BOOKS			
298	Compu-Style	Business Opportunities	375
124	ZD Press	Books	230-231
178	ZD Press	Books	378
CD-ROM			
049	Acclaim Entertainment	Magic the Gathering Battlemage	357
*	Adaptec	SCSI CD-Recordable	348
077	Hewlett-Packard-Colorado Memory Systems	CD Recordable	202
367	LG Electronics USA	16X CD-ROM Drive	193
CHIPS/PROCESSORS			
*	Advanced Micro Devices	Microprocessor	68-69
106	Kingston Technology	Kingston Memory	194
019	L.A. Trade	Memory	272
391/138	Micro Mail/H Co.	Memory, PCMCIA, Hard Drives	291
*	S3 Incorporated	Descent II	369
*	S3 Incorporated	Megarace 2	371
*	S3 Incorporated	S3 Chips	373
COMMUNICATIONS SOFTWARE			
166	Intercon Corp.	Connect 4 Windows NFS Version	243
*	Lotus Development Corporation	Lotus Domino	136-137
341	McAfee Associates, Inc.	McAfee Family of Products	188-189
299	McAfee Associates, Inc.	Anti Virus	206-207
070	The Forefront Group	ClickBook	244
312	The Forefront Group	WebSeeker, WebWhacker, WebPrinter	246
COMPUTERS/COMPATIBLES			
122	AST Research	AST Computers	178-179
034	Acer America	Acer Aspire	90-92
336	Arlington Computer Products	Mail Order, Peripherals	292-293
012	Austin Direct	Austin Direct Desktops & Notebooks	119-121
*	Compaq Computer Corporation	Systems	190-191
*	Compaq Computer Corporation	Systems	211-218
*	Compaq Computer Corporation	Desktops	74-75
*	CompUSA Direct	Mail Order	265-268
159	COMPUTER DISCOUNT WAREHOUSE	Hardware	252-253
318	COMPUTER DISCOUNT WAREHOUSE	Hardware	254-255
348	CompuTrend, Inc.	Premio HX Systems	196
084	Comtrade	Comtrade Notebooks and Systems	262-263
343	CyberMax Computer	CyberMax Systems	204-205
372	DTK Computer	DTK Systems	61
*	Dell Computer Corporation	Desktops, Laptops, Servers	C5-C8
*	Dell Computer Corporation	Dimension	168-169
*	Dell Computer Corporation	Optiplex Workstations	18-19
*	Dell Computer Corporation	Dimension	72
014	First Source International	Memory, Notebooks, Peripherals	295
089	FOSA Computer	Portables	261
*	Gateway 2000	PCs	48-49
062	HARTFORD COMPUTER GROUP	Mail Order	279
*	Hewlett-Packard	HP PCs	30-31
*	Hewlett-Packard	HP OmniBook	33
*	IBM Corporation	Thinkpad 365	175
*	Leap Frog Labs	Everex Step Premier, Everex P100	282-283
045	Magix	Desktop Computers	275
*	Micro Warehouse	Systems	296-297
164	Micron Electronics	Micron PCs	109-114
370	Micron Electronics	Micron PCs	115
119	Micron Electronics	Micron PCs	88
010	Midwest Computer Works	PCs	274-275
107	NEC Technologies	NEC VERSA	154-155
155	NEC Technologies	NEC Powermate	222
327	NECX	PCs	271
079	Nexar	Nexar PC's	171
394	Olivetti	Echo Notebooks	182-183
047	PC Connection	PCs, Peripherals, Software	284-285
192	PCs Complete	PCs, Notebooks, Software	286-287
092	PCs Complete	PCs, Notebooks, Software	288-289
268	PCs Complete	PCs, Notebooks, Software	290
287	ProGen Systems	Desktop Computers	100
309	S.A.G./Storage Solutions	Servers and Storage	62-63
201	Swan Technologies	PCs	106-107
379	Toshiba America	Desktop Computers	16-17
378	Toshiba America	Notebook Computers	164-165
051	USA Flex	Notebooks, Desktop PC's, Peripherals, Printers	280
201	Zenith Data Systems Direct	PCs	106-107
DATA BASE MANAGERS			
*	Lotus Development Corporation	Lotus Smart Suite OS/2	167
*	Lotus Development Corporation	Lotus Approach	221
DESKTOP ORGANIZERS			
*	Lotus Development Corporation	Lotus Organizer	195
*	Lotus Development Corporation	Lotus Organizer	197
*	Lotus Development Corporation	Lotus Organizer	199
*	Lotus Development Corporation	Lotus Organizer	201
*	Lotus Development Corporation	Lotus Organizer	203
*	Micrografix	Promotional Campaign	71
DISK BACKUP & TAPE DRIVES			
856	Micro Solutions Computer Products	8000T	270
855	Micro Solutions Computer Products	Backpack PD/CD	294
DISPLAYS/MONITORS			
226	ADI Systems Inc.	Monitors	55
329	CTX International	EzPro 500 LCD Multimedia Projector	80

Reader Service

No.	Company	Product	Page
010	Midwest Computer Works	Monitors	274-275
039	Princeton Graphic Systems	Princeton Graphic Systems Monitors	105
EDUCATIONAL SOFTWARE			
351	Banner Blue Software	Family Tree Maker	379
ENTERTAINMENT SOFTWARE			
383	7th Level Inc.	Monty Python: Quest for the Holy Grail	368
351	Banner Blue Software	Family Tree Maker	379
389	CyberCard	NFL Cybercard	381
*	RandomSoft, Inc.	Smart Games	366
FAX SOFTWARE			
222	Symantec Corporation	Peter Norton Group PCAnywhere	143-146
FLOWCHARTING SOFTWARE			
*	Micrografix	Promotional Campaign	71
GENEALOGY SOFTWARE			
351	Banner Blue Software	Family Tree Maker	379
GRAPHICS SOFTWARE			
292	Caera Corporation	OmniPage Pro	8
011	Corel Corporation	WP7 Ask the Expert	20
322	Corel Corporation	Draw 7	200
044	Corel Corporation	Office Pro 7/Internet	228
258	Corel Corporation	Ventura 7	34
353	Corel Corporation	Printhouse/Photohouse	358
042	Corel Corporation	Mega Gallery	359
207	Corel Corporation	Web Graphics	370
103	Corel Corporation	Games Combo	380
037	Corel Corporation	Bradshaw Football	384
194	Macromedia	Authorware Studio	240
*	Micrografix	Promotional Campaign	71
HAND-HELD PC'S			
125	Casio	Cassiopeia Hand Held PC	82-83
*	Palm Computing Inc.	Pilot Organizer	44
HARD DRIVES			
283	MEGAHAUS	Mass Storage	258-259
391/138	Micro Mail/H Co.	Memory, PCMCIA, Hard Drives	291
HARDWARE			
034	Acer America	Acer Aspire	90-92
*	Adaptec	Servers	51
*	Advanced Micro Devices	Microprocessor	68-69
235	AMS Tech	AMS Tech TravelPro 2000 Notebooks	41
012	Austin Direct	Austin Direct Desktops & Notebooks	119-121
329	CTX International	EzPro 500 LCD Multimedia Projector	80
125	Casio	LCD Digital Camera QV-100	82-83
*	Compaq Computer Corporation	Systems	190-191
*	Compaq Computer Corporation	Systems	211-218
*	Compaq Computer Corporation	Presario	225
*	Compaq Computer Corporation	Desktop	74-75
348	CompuTrend, Inc.	Premio HX Systems	196
084	Comtrade	Comtrade Notebooks and Systems	262-263
343	CyberMax Computer	CyberMax Systems	204-205
372	DTK Computer	DTK Systems	61
*	Dell Computer Corporation	Desktops, Laptops, Servers	C5-C8
*	Dell Computer Corporation	Dimension	168-169
*	Dell Computer Corporation	Optiplex Workstations	18-19
*	Dell Computer Corporation	Dimension	72
189	Diamond Multimedia Systems	Modem Family	364
098	Diamond Multimedia Systems	Video Conferencing	382
004	Epson America	Printers	12-13
005	Epson America	Digital Cameras	198
*	Fuji Computer Media	Fuji Photographic Printer	365
114	Fujitsu PC Corporation	Notebooks	56-57
224	Fujitsu PC Corporation	Notebooks	58-59
*	Hewlett-Packard	HP PCs	30-31
*	Hewlett-Packard	HP OmniBook	33
082	Hitachi PC Corporation	Hitachi E Series Notebooks	38-39
*	IBM Corporation	Thinkpad 365	175
*	IBM Corporation	Modems	177
106	Kingston Technology	Kingston Memory	194
367	LG Electronics USA	16X CD-ROM Drive	193
*	Leap Frog Labs	Everex Step Premier, Everex P100	282-283
045	Magix	Desktop Computers	275
283	MEGAHAUS	Mass Storage	258-259
*	Micro Warehouse	Systems	296-297
327	NECX	Peripherals	271
266	Netgear	Ethernet Hub	358
263	Nimantics	Notebook Computers	181
394	Olivetti	Echo Notebooks	182-183
080	PC Power and Cooling	Power Protection/Cooling Devices	88
*	Palm Computing Inc.	Pilot Organizer	44
309	S.A.G./Storage Solutions	Servers and Storage	62-63
*	S3 Incorporated	Descent II	369
*	S3 Incorporated	Megarace 2	371
*	S3 Incorporated	S3 Chips	373
033	Samsung	SensPro 500 Notebooks	176
001	Tektronix Inc.	Graphics & Imaging Printers	98
HUBS			
266	Netgear	Ethernet Hub	358
INTEGRATED SOFTWARE			
*	Lotus Development Corporation	Lotus Domino	136-137
INTERNET			
186	BayNetworks, Inc.	Instant Internet	140
295	Cyber Media	Oil Change	247
225	Earthlink	Earthlink Network TotalAccess Software	138
241	FTP Software, Inc.	FTP Software	134
*	Hughes Network Systems	Hughes Network Systems	133
166	Intercon Corp.	Connect 4 Windows NFS Version	243

Advertisers' Index PRODUCTS

Reader Service

No.	Company	Product	Page
006	Lotus Development Corporation	Lotus Domino	136-137
137	Luckman Interactive	Web Commander	141
135	Protec Microsystems Inc	Internet	132
070	Sun Microsystems	JAVA	248
312	The Forefront Group	ClickBook	244
021	The Forefront Group	WebSeeker, WebWhacker, WebPrinter	246
303	Thunder & Lightning	Web Factory	123
	ZD Net	NetBuyer	245

LABEL/FORM SOFTWARE

292	Caere Corporation	OmniPage Pro	8
-----	-------------------	--------------	---

LAPTOP/PORTABLE COMPUTERS

235	AMS Tech	AMS Tech TravelPro 2000 Notebooks	41
122	AST Research	AST Computers	178-179
012	Austin Direct	Austin Direct Desktops & Notebooks	119-121
	Compaq Computer Corporation	Presario	225
	CompUSA Direct	Mail Order	265-268
159	COMPUTER DISCOUNT WAREHOUSE	Laptops	252-253
318	COMPUTER DISCOUNT WAREHOUSE	Laptops	254-255
084	Comtrade	Comtrade Notebooks and Systems	262-263
	Dell Computer Corporation	Desktops, Laptops, Servers	C5-C8
	Everex Systems	Notebooks	374
014	First Source International	Memory, Notebooks, Peripherals	295
089	FOSA Computer	Portables	261
114	Fujitsu PC Corporation	Notebooks	56-57
224	Fujitsu PC Corporation	Notebooks	58-59
	Gateway 2000	Notebooks	48-49
062	HARTFORD COMPUTER GROUP	Mail Order	279
	Hewlett Packard	HP OmniBook	33
082	Hitachi PC Corporation	Hitachi E Series Notebooks	38-39
	IBM Corporation	Thinkpad 365	175
013	Micron Electronics	Micron Notebooks	127-130
010	Midwest Computer Works	Hardware	274-275
107	NEC Technologies	NEC VERSA	154-155
263	Nimantics	Notebook Computers	181
394	Olivetti	Echo Notebooks	182-183
192	PCs Complete	PCs, Notebooks, Software	286-287
092	PCs Complete	PCs, Notebooks, Software	288-289
268	PCs Complete	PCs, Notebooks, Software	290
033	Samsung	SensPro 500 Notebooks	176
368	Texas Instruments	TI Notebooks	15
246	Texas Instruments	TI Notebooks	98-99
378	Toshiba America	Notebook Computers	164-165
051	USA Flex	Notebooks, Desktop PC's, Peripherals, Printers	280
085	Winbook	Notebooks	77

LOCAL AREA NETWORKING

186	BayNetworks Inc	Instant Internet	140
159	COMPUTER DISCOUNT WAREHOUSE	Networking Products	252-253
318	COMPUTER DISCOUNT WAREHOUSE	Networking Products	254-255
062	HARTFORD COMPUTER GROUP	Mail Order	279
	Intel Corporation	Landesk	11
	Intel Corporation	Adapters	53
266	Netgear	Ethernet Hub	358

MAIL ORDER

336	Arlington Computer Products	Mail Order, Peripherals	292-293
169	Bulldog Computers	Mail Order	273
	CompUSA Direct	Mail Order	265-268
159	COMPUTER DISCOUNT WAREHOUSE	Reseller	252-253
318	COMPUTER DISCOUNT WAREHOUSE	Reseller	254-255
014	First Source International	Memory, Notebooks, Peripherals	295
089	FOSA Computer	Portables	261
	Gateway 2000	Mail Order	48-49
278	Insight Direct	Insight Mail Order	298-299
019	L.A. Trade	Memory	272
045	Magix	Desktop Computers	257
283	MEGAHAUS	Mass Storage	258-259
391/138	Micro Mail/H Co	Memory, PCMCIA, Hard Drives	291
120	Micron Electronics	Millenia Transport	26-27
010	Midwest Computer Works	Mail Order	274-275
327	NECX	PCs, Peripherals, Software	271
263	Nimantics	Notebook Computers	181
047	PC Connection	PCs, Peripherals, Software	284-285
192	PCs Complete	PCs, Notebooks, Software	286-287
092	PCs Complete	PCs, Notebooks, Software	288-289
268	PCs Complete	PCs, Notebooks, Software	290
201	Swan Technologies	PCs	106-107
051	USA Flex	Notebooks, Desktop PC's, Peripherals, Printers	280
201	Zenith Data Systems Direct	PCs	106-107

MASS STORAGE

077	Hewlett Packard-Colorado Memory Systems	CD Recordable	202
283	MEGAHAUS	Mass Storage	258-259
856	Micro Solutions Computer Products	8000T	270
855	Micro Solutions Computer Products	Backpack PD/CD	294

MEMORY

014	First Source International	Memory, Notebooks, Peripherals	295
106	Kingston Technology	Kingston Memory	194
019	L.A. Trade	Memory	272
391/138	Micro Mail/H Co	Memory, PCMCIA, Hard Drives	291

MISCELLANEOUS

	ABIT Computers	PCs	232
298	Compu-Style	Business Opportunities	375
335	Sun Microsystems	JAVA	5

MODEMS

189	Diamond Multimedia Systems	Modem Family	364
098	Diamond Multimedia Systems	Video Conferencing	382
	IBM Corporation	Modems	177
	Megahertz Corp	PC Cards Family/Announce USA Affiliation	116-117
	US Robotics Inc	X2 Technology	159-162
	Xircom	Combo Card	25

Reader Service

No.	Company	Product	Page
MULTIMEDIA			
329	CTX International	EzPro 500 LCD Multimedia Projector	80
	CompUSA Direct	Mail Order	265-268
017	Connectix	Color QuickCAM	208
062	HARTFORD COMPUTER GROUP	Mail Order	279
194	Macromedia	Authorware Studio	240
381	Matrox Graphics Inc	Graphics Accelerator	352-353
856	Micro Solutions Computer Products	8000T	270
855	Micro Solutions Computer Products	Backpack PD/CD	294
394	Olivetti	Echo Notebooks	182-183
	S3 Incorporated	Descent II	369
	S3 Incorporated	Megarace 2	371
	S3 Incorporated	S3 Chips	373

MULTIMEDIA SOFTWARE

049	Acclaim Entertainment	Magic the Gathering Battlemage	357
351	Banner Blue Software	Family Tree Maker	379
017	Connectix	Color QuickCAM	208
011	Corel Corporation	WP7 Ask the Expert	20
322	Corel Corporation	Draw 7	200
044	Corel Corporation	Office Pro 7/Internet	228
258	Corel Corporation	Ventura 7	34
353	Corel Corporation	Printhouse/Photohouse	356
042	Corel Corporation	Mega Gallery	359
207	Corel Corporation	Web Graphics	370
103	Corel Corporation	Games Combo	380
037	Corel Corporation	Bradshaw Football	384
	Micrografx	Promotional Campaign	71

NETWORK INTERFACE CARDS

	Xircom	Combo Card	25
--	--------	------------	----

NETWORKING SOFTWARE

	Intel Corporation	Landesk	11
	Intel Corporation	Adapters	53
166	Intercon Corp.	Connect 4 Windows NFS Version	243

ON LINE DATABASE/SERVICES

304	America Online	AOL Primehost	229
320	Prodigy Services	Prodigy	22-23

ORGANIZATIONAL SOFTWARE

	Microsoft	Microsoft Project	C2-C4, p1
--	-----------	-------------------	-----------

OS/2 SOFTWARE

	Lotus Development Corporation	Lotus Smart Suite OS/2	167
--	-------------------------------	------------------------	-----

PC DIRECT

336	Arlington Computer Products	Mail Order, Peripherals	292-293
169	Bulldog Computers	Hardware, Peripherals	273
	CompUSA Direct	Mail Order	265-268
084	Comtrade	Comtrade Notebooks and Systems	262-263
159	COMPUTER DISCOUNT WAREHOUSE	Reseller	252-253
318	COMPUTER DISCOUNT WAREHOUSE	Reseller	254-255
014	First Source International	Memory, Notebooks, Peripherals	295
089	FOSA Computer	Portables	261
062	HARTFORD COMPUTER GROUP	Mail Order	279
278	Insight Direct	Insight Mail Order	298-299
019	L.A. Trade	Memory	272
	Leap Frog Labs	Everex Step Premier, Everex P100	282-283
045	Magix	Desktop Computers	257
283	MEGAHAUS	Mass Storage	258-259
391/138	Micro Mail/H Co	Memory, PCMCIA, Hard Drives	291
856	Micro Solutions Computer Products	8000T	270
855	Micro Solutions Computer Products	Backpack PD/CD	294
	Micro Warehouse	Systems	296-297
010	Midwest Computer Works	Reseller	274-275
327	NECX	PCs, Peripherals, Software	271
047	PC Connection	PCs, Peripherals, Software	284-285
192	PCs Complete	PCs, Notebooks, Software	286-287
092	PCs Complete	PCs, Notebooks, Software	288-289
268	PCs Complete	PCs, Notebooks, Software	290
043	SPSS Inc	SPSS for Windows	281
051	USA Flex	Notebooks, Desktop PC's, Peripherals, Printers	280

PCMCIA

	Adaptec	SCSI CD-Recordable	348
	Megahertz Corp	PC Cards Family	116-117
391/138	Micro Mail/H Co	Memory, PCMCIA, Hard Drives	291
	US Robotics Inc	X2 Technology	159-162
	Xircom	Combo Card	25

PERIPHERALS

336	Arlington Computer Products	Mail Order, Peripherals	292-293
017	Connectix	Color QuickCAM	208
189	Diamond Multimedia Systems	Modem Family	364
098	Diamond Multimedia Systems	Video Conferencing	382
004	Epson America	Printers	12-13
014	First Source International	Memory, Notebooks, Peripherals	295
	Fuj Computer Media	Fuj Photographic Printer	365
	Gateway 2000	Peripherals	48-49
	IBM Corporation	Modems	177
047	PC Connection	PCs, Peripherals, Software	284-285
201	Swan Technologies	PCs	106-107
001	Tedronix Inc	Graphics & Imaging Printers	96
201	Zenith Data Systems Direct	PCs	106-107

POWER PROTECTION

162	American Power Conversion	Back-UPS Office	361-362
080	PC Power and Cooling	Power Protection/Cooling Devices	88

PRESENTATION SOFTWARE

194	Macromedia	Authorware Studio	240
-----	------------	-------------------	-----

PRINTERS

	Canon Computer Systems	Canon Printers	2-3
--	------------------------	----------------	-----

Advertisers' Index PRODUCTS

Reader Service

No.	Company	Product	Page
004	Epson America	Printers	12-13
•	Fuji Computer Media	Fuji Photographic Printer	365
•	Hewlett Packard	HP Jona	124-125
001	Tektronix Inc.	Graphics & Imaging Printers	96
051	USA Flex	Notebooks, Desktop PC's, Peripherals, Printers	280
PROGRAM DEVELOPERS			
007	Rainbow Technologies	Rainbow Sentinel Software Protection	235
PROGRAMMERS TOOLS UTILITIES			
007	Rainbow Technologies	Rainbow Sentinel Software Protection	235
PROJECT MANAGEMENT SOFTWARE			
148	Primavera Systems	P32 0	67
REMOTE COMPUTING			
341	McAfee Associates, Inc.	McAfee Family of Products	188-189
299	McAfee Associates, Inc.	Anti Virus	206-207
•	US Robotics Inc.	X2 Technology	159-162
SECURITY			
007	Rainbow Technologies	Rainbow Sentinel Software Protection	235
SERVERS			
•	Adaptec	Servers	51
012	Austin Direct	Austin Direct Desktops & Notebooks	119-121
•	Dell Computer Corporation	Desktops, Laptops, Servers	C5-C8
•	Dell Computer Corporation	Dimension	168-169
•	Dell Computer Corporation	Optiplex Workstations	18-19
•	Dell Computer Corporation	Dimension	72
120	Micron Electronics	Milenia Transport	26-27
309	S A G/Storage Solutions	Servers and Storage	62-63
SOFTWARE			
383	7th Level Inc.	Monty Python Quest for the Holy Grail	368
304	America Online	ADL Primehost	229
351	Banner Blue Software	Family Tree Maker	379
347	Broderbund Software	Carmen San Diego	355
349	Broderbund Software	Print Shop Deluxe	376-377
295	Cyber Media	Oil Change	247
389	CyberCard	NFL Cybercard	381
225	Earthlink	Earthlink Network TotalAccess Software	138
•	Intel Corporation	Landesk	11
•	Intel Corporation	Adapters	53
166	Intercon Corp.	Connect 4 Windows NFS Version	243
•	Lotus Development Corporation	Lotus Smart Suite OS/2	167
•	Lotus Development Corporation	Lotus SmartSuite	78-79
006	Luckman Interactive	Web Commander	141
341	McAfee Associates, Inc.	McAfee Family of Products	188-189
299	McAfee Associates, Inc.	Anti Virus	206-207
214	MicroHelp Inc.	Uninstaller	84
•	Microsoft	Microsoft Project	C2-C4, p1
327	NECX	Software	271
047	PC Connection	PCs, Peripherals, Software	284-285
192	PCs Complete	PCs, Notebooks, Software	286-287
092	PCs Complete	PCs, Notebooks, Monitors	288-289
268	PCs Complete	PCs, Notebooks, Software	290
148	Primavera Systems	P32 0	67
043	SPSS, Inc.	SPSS for Windows	281
135	Sun Microsystems	JAVA	248
222	Symantec Corporation	Peter Norton Group PCAnywhere	143-146
SPREADSHEET/TEMPLATES			
•	Lotus Development Corporation	Lotus SmartSuite	78-79
STATISTICAL SOFTWARE			
043	SPSS, Inc.	SPSS for Windows	281
057	Statsoft	Statistical Software	43
TAX SOFTWARE			
•	Intuit Software	TurboTax	383
UTILITIES			
225	Earthlink	Earthlink Network TotalAccess Software	138
006	Luckman Interactive	Web Commander	141
341	McAfee Associates, Inc.	McAfee Family of Products	188-189
299	McAfee Associates, Inc.	Anti Virus	206-207
214	MicroHelp Inc.	Uninstaller	84
222	Symantec Corporation	Peter Norton Group PCAnywhere	143-146
VIDEO CONFERENCING			
189	Diamond Multimedia Systems	Modem Family	364
098	Diamond Multimedia Systems	Video Conferencing	382
WINDOWS SOFTWARE			
166	Intercon Corp.	Connect 4 Windows NFS Version	243
•	Lotus Development Corporation	Lotus SmartSuite	78-79
341	McAfee Associates, Inc.	McAfee Family of Products	188-189
299	McAfee Associates, Inc.	Anti Virus	206-207
•	Micrografix	Promotional Campaign	71
214	MicroHelp Inc.	Uninstaller	84
•	Microsoft	Microsoft Project	C2-C4P1
148	Primavera Systems	P32 0	67
043	SPSS, Inc.	SPSS for Windows	281
057	Statsoft	Statistical Software	43
WORD PROCESSING SOFTWARE			
•	Lotus Development Corporation	Lotus SmartSuite	78-79
WORKSTATIONS			
•	Hewlett Packard	HP PCs	30-31
•	Leap Frog Labs	Everex Step Premier, Everex P100	282-283

For Additional Categories see MARKETPLACE PRODUCT INDEX PAGE 346.

Coming Up

What's in the Next Issue of *PC Magazine*

Best of 1996

With chip speeds topping 200 MHz, 12X CD-ROM drives, and more new Internet- and Web-based tools than you can shake a stick at, finding the 50 best products of 1996 was more a process of elimination than a treasure hunt. Come along with us as we look back fondly on the products that impressed and surprised us.

Java Tools: The Second Generation

Java is quickly changing the programming landscape, both on and off the Web. Our story offers detailed reviews and performance testing of the latest offerings from Asymetrix, Borland, IBM, Microsoft, Sun, Symantec, and Watcom.

Digital Cameras

With their easy point-and-shoot designs and their increasingly affordable prices, digital cameras are appealing to a wider audience. Web designers, desktop publishers, marketers, and real-estate and insurance agents can all benefit from these productivity tools to capture images quickly and load them directly onto their PCs. We review 11 cameras priced below \$1,000.



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Editorial Product Index

Reader Service No.	Product	Company	Page
441	Acer Aspire Personal Solution	Acer America Corp.	157
441	Acer Aspire Ultimate Solution	Acer America Corp.	157
456	BoundsChecker Professional 4.0	NuMega Technologies	219
954	CLI Desktop Video System 1000	Compression Labs Inc.	NE10
442	Compaq Presario 4122	Compaq Computer Corp.	163
442	Compaq Presario 8712	Compaq Computer Corp.	163
417	CompuServe 3.0	CompuServe Inc.	54
404	DataBurst ISDN 128K	U.S. Robotics Inc.	66
401	e-Check	Peachtree Software Inc.	73
443	Gateway G6-200FPC	Gateway 2000 Inc.	174
443	Gateway P5-166FPC	Gateway 2000 Inc.	174
414	HP LaserJet 5Si Mopier	Hewlett-Packard Co.	60
444	HP Pavilion 7270	Hewlett-Packard Co.	177
444	HP Pavilion 7295V	Hewlett-Packard Co.	177
445	IBM Aptiva C55	IBM Consumer Division	188
445	IBM Aptiva S78	IBM Consumer Division	188
402	Impos/2	Compart	73
951	IntranetWare	Novell Inc.	NE17
446	Micron Home MPC P166	Micron Electronics Inc.	192
446	Micron Home MPC P200	Micron Electronics Inc.	192
410	Microsoft IntelliMouse	Microsoft Corp.	65
411	MultiSync P1150	NEC Technologies Inc.	64
447	NEC Ready 9624	NEC Computer Systems Division	197
447	NEC Ready 9628	NEC Computer Systems Division	197
415	Norton AntiVirus 2.0 for Windows 95	Symantec Corp.	52
418	Norton Your Eyes Only	Symantec Corp.	45
407	Ornamatica	JASC Inc.	76
448	Packard Bell Platinum Pro 755	Packard Bell	199
448	Packard Bell Platinum 60	Packard Bell	199
412	PanaSync Pro P21	Panasonic Computer Peripheral Co.	64
451	Performa 6400/200	Apple Computer Inc.	166
419	PGP for Windows, Business edition	ViaCrypt	45
403	Photo>Graphics	TrueSpectra Inc.	73
956	PictureTel Live200p	PictureTel Corp.	NE13
955	ProShare Conferencing Video System 200	Intel Corp.	NE10
457	Purify for Windows NT	Pure Atria Corp.	220
406	ScanAce III	Pacific Image Electronics Co.	76
420	SecretAgent	AT&T Business Communications Services	45
421	SecurPC for Windows 95	RSA Data Security Inc.	45
405	Sony DVBK-1000	Sony Electronics Inc.	66
449	Sony PCV-90	Sony Electronics Inc.	203
450	Toshiba Infinia 7200	Toshiba America Information Systems Inc.	206
413	ViewSonic P815	ViewSonic Corp.	64
416	VirusScan 2.0 for Windows 95	McAfee Inc.	52
409	VisualX for ActiveX 1.0	InterGroup Technologies Inc.	70
957	VTEL Personal Collaborator	VTEL Corp.	NE14
408	Web Buddy 1.0	DataViz	70

NE—Network Edition.

For information about the Network Edition of *PC Magazine*, call Circulation at 800-289-0429.

Abort, Retry, Fail?

THE LIGHTER SIDE OF PERSONAL COMPUTING

By Don Willmott



Not since the "Get Smart" Cone of Silence have we seen a gadget like this. And she's using it to play Hearts! (Hammacher-Schlemmer catalog.)

Microsoft Limerick du Jour

Bill Gates built a very big house.
He loved it, but not so his spouse:
"It's huge and it's drafty,
And you have to be crafty
When you spend all day strapped
to a mouse."



"It's a free starter disk for AOL."

Halston Was Dead and Therefore Unavailable

The launch party for Toshiba's new home PCs was held at New York's Vanderbilt Mansion, so who better to give her stamp of approval to the systems than seventies designer-jeans queen Gloria Vanderbilt herself? By all accounts, she looked good (if alarmingly thin) but didn't have much of substance to contribute to the conversation when it came to megahertz and megabytes.



Eliminate soar wrists

#129940
SubSpot Desktop Keyboard Pad
BlackCUE \$19.94
#130991
SubSpot Mouse Pad
BlackCUE \$19.94

But it doesn't eliminate stupid spelling mistakes. (Egghead catalog.)

Phone Call from The Twilight Zone

Senior associate editor Lance Ulanoff reports this recent telephone encounter:

CALLER: "Hi. I wrote a program and I want to find a distributor for it."
ULANOFF: "Well, why don't you get on the Internet and—"
CALLER: "Oh, I don't have a PC."
ULANOFF: "You wrote a program, but you don't have a PC?"
CALLER: "Well, I didn't write it. I had a program applicator [sic] write it just the way I wanted it."
ULANOFF: "Uh-huh."

Interactive CD-ROM Teaches Basics of Sexual Harassment

LAGRANGE, GA.—Managers and executives can learn how to spot and avoid sexual harassment with an interactive training program, Sexual Harassment: Avoiding Liability Claims.

The new CD-ROM release from Audio Graphics Training Systems covers the basics of sexual harassment—

the program.

The course may be customized so that specific organizational policies, procedures and custom questions may be included. In addition, employees taking the course are

through the Clar

software m-

aid pro quo, hostile work enviro-

In case you need to brush up on your skills. (Legal Product News.)

If your entry is used, we'll send you \$50 and a *PC Magazine* T-shirt. Send your entries to Abort, Retry, Fail?, *PC Magazine*, One Park Ave., New York, NY 10016-5802 or, via e-mail (text items only), to don_willmott@zd.com. Winners this issue: Tobias Iaconis, Phil Johnston, Jake Kirchner, Stephen Romeo, and Lance Ulanoff.

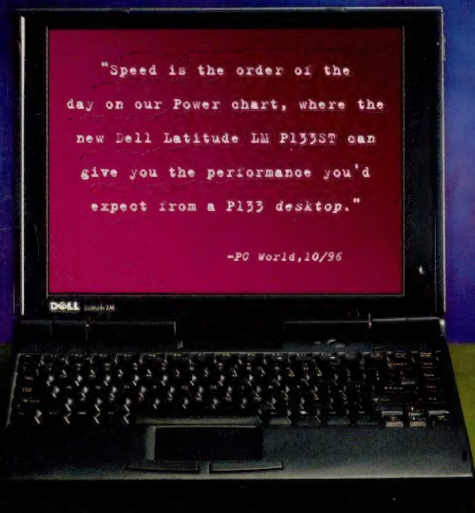
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ACCORDING TO PC WORLD THIS IS NOT A NOTEBOOK.

The Dell Latitude LM P133ST. It looks like a notebook. Yet it performs like a desktop. Sounds like someone's going to have to start a new category! All thanks to *PC World* who started it when they gave us their Best Buy award and said, "the Dell Latitude LM P133ST is a hands-down Best Buy for users looking for a desktop replacement." A bold statement.



They also said things like it's the "fastest notebook we've ever tested." And "Pros: Large, crisp screen; terrifically fast. Cons: none." And to think they didn't even get to its 128-bit graphics accelerator which gives you amazing graphic abilities that your desktop-laden co-workers will envy.

We could go on and on. They certainly did. But we'll let you get to a phone first.

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